THE

JOURNAL

OF

GAS LIGHTING,

WATER SUPPLY,

ETC.

VOL. CIII.

JULY TO SEPTEMBER, 1908.

LONDON:

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1908.

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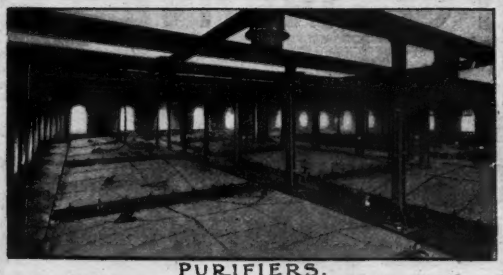

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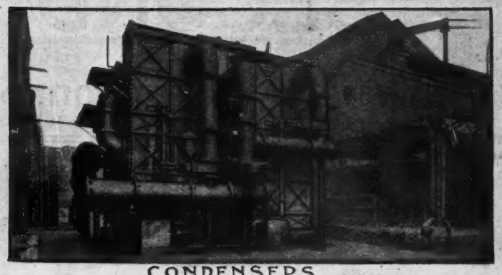

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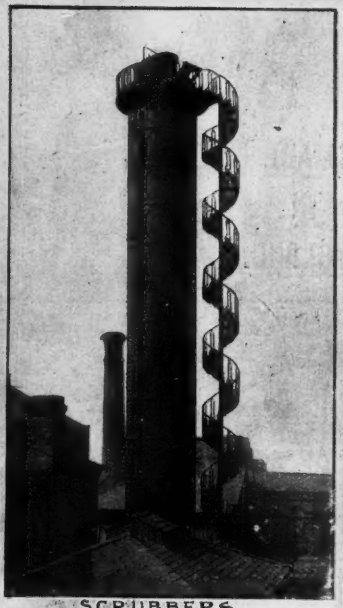

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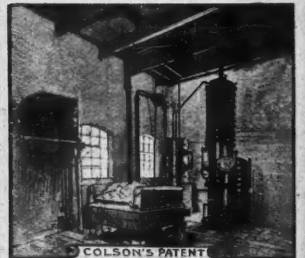

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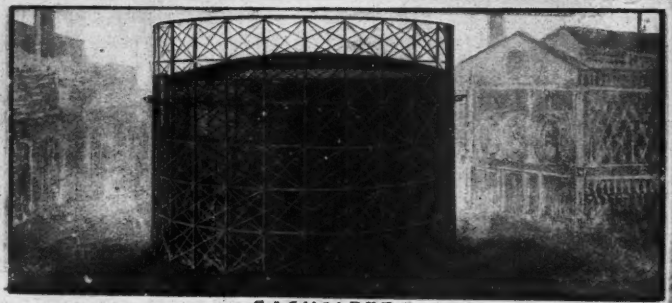

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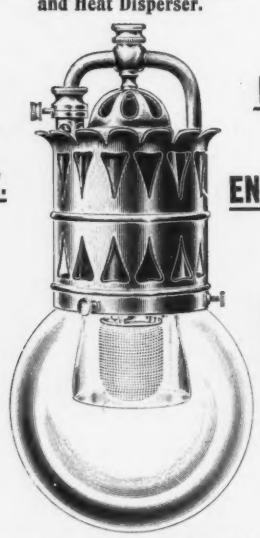

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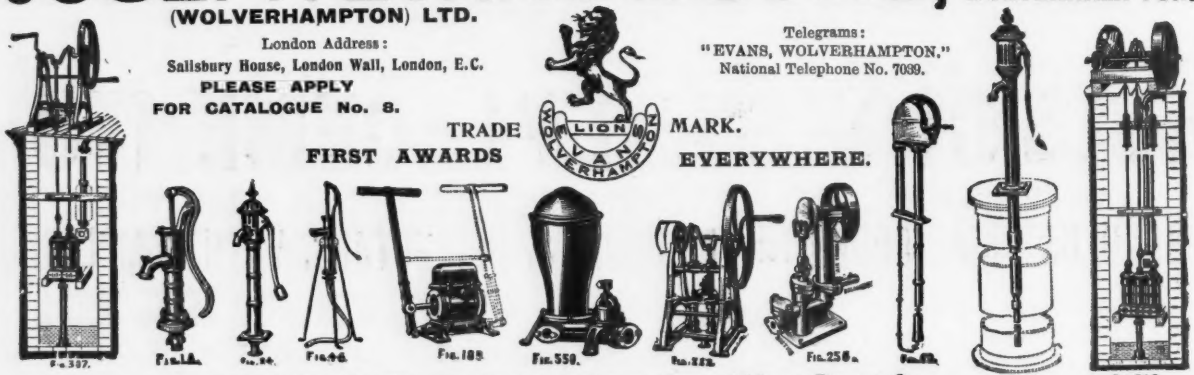

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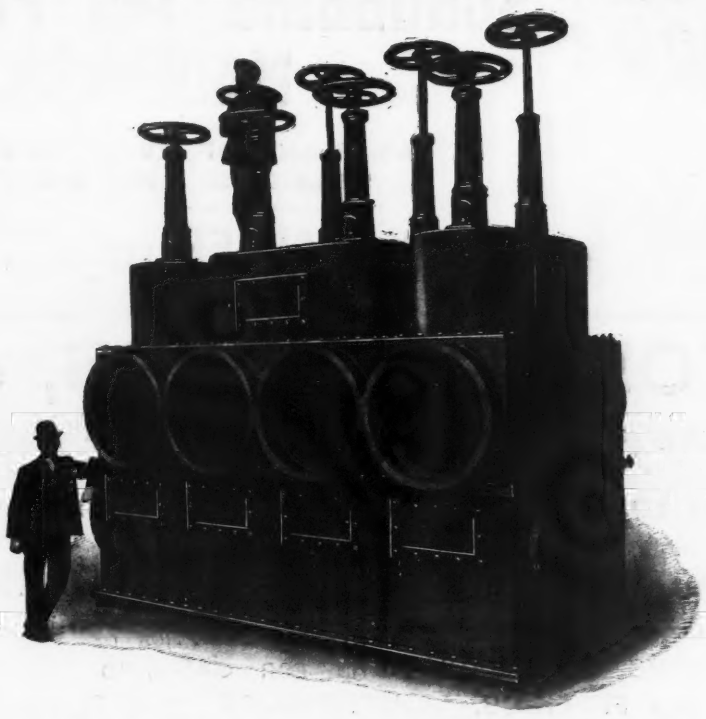

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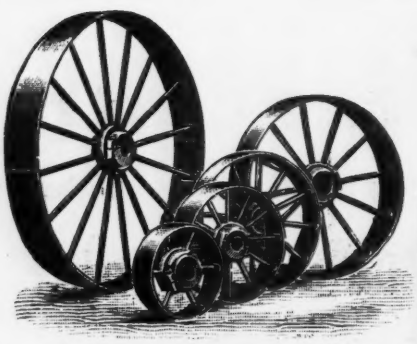

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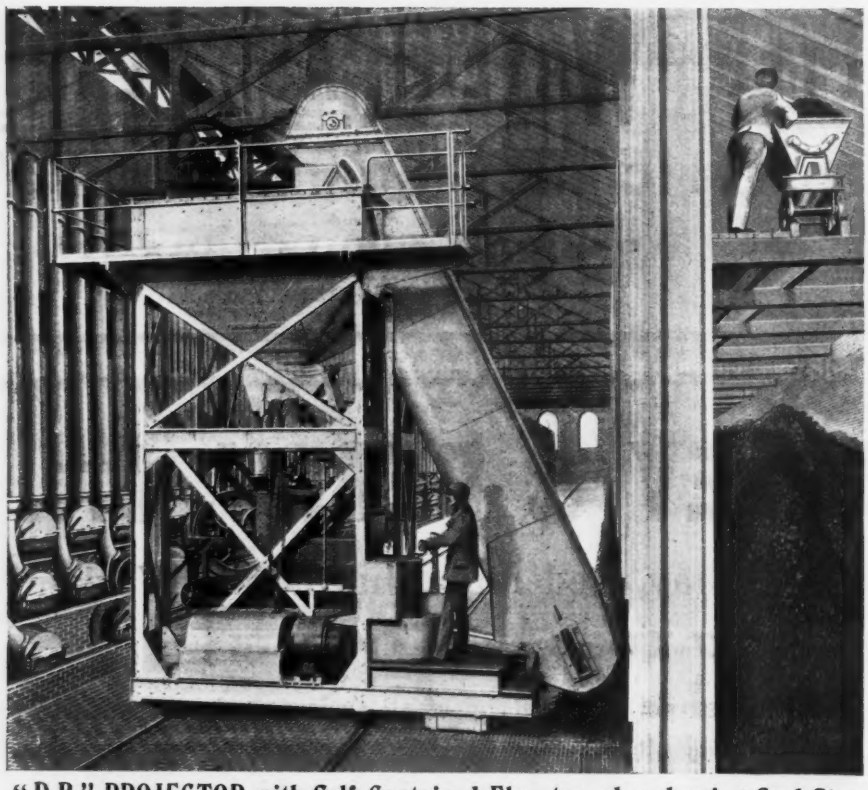

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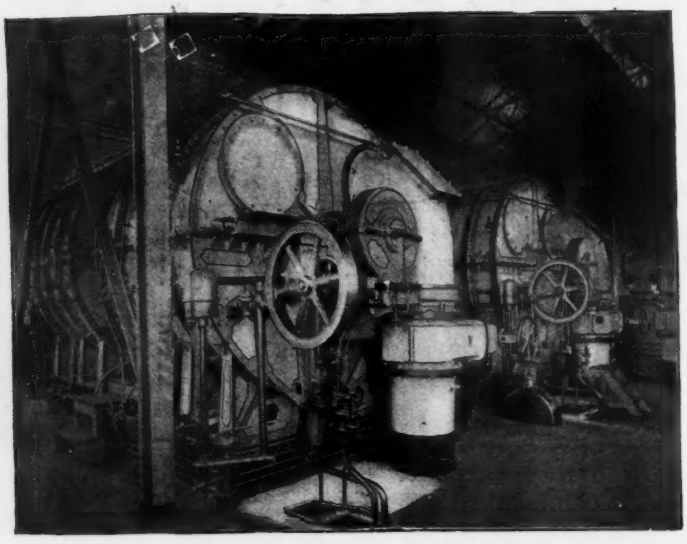

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Brussels—Koekelberg	1,000,000	Leeuwarden, Holland	400,000	Stockport (2nd)	600,000
Brussels—St. Gilles	1,000,000	Leiden, Holland	500,000	Stockport (3rd)	400,000
Brussels—St. Josse	1,000,000	Leigh, Lancs.	350,000	Stockton-on-Tees	500,000
Brussels—St. Josse (2nd)	600,000	Lemberg, Galicia	260,000	Swansea	750,000
Brussels—Ville	750,000	Liége, Belgium	1,000,000	Swansea (2nd)	1,000,000
Brussels—Ville (2nd)	750,000	Liége (2nd)	750,000	Swindon	300,000
Brussels—Ville (3rd)	1,500,000	Lincoln	500,000	Sydney—Harbour	500,000
Brussels—Ville (4th)	350,000	Liverpool	3,500,000	Sydney—Harbour (2nd)	500,000
Budapest, Hungary	50,000	Liverpool (2nd)	4,500,000	Sydney—Mortlake	500,000
Budapest (2nd)	1,750,000	Longton	600,000	Sydney—Mortlake (2nd)	500,000
Carlisle	600,000	Maastricht, Holland	200,000	Syracuse, N.Y.	850,000
Carlsruhe, Germany	500,000	Magdeburg, Germany	1,400,000	Taunton	225,000
Chigwell	350,000	Maidenhead	225,000	Taunton (2nd)	350,000
Chorley	300,000	Maidenhead (2nd)	225,000	The Hague, Holland	1,000,000
Commercial, London	850,000	Maidstone	500,000	The Hague (2nd)	500,000
Commercial (2nd)	850,000	Malmö, Sweden	350,000	Tilburg, Holland	400,000
Commercial (3rd)	1,250,000	Malta	400,000	Tottenham	750,000
Commercial (4th)	2,000,000	Manchester	3,500,000	Tottenham (2nd)	750,000
Copenhagen	700,000	Manchester (2nd)	3,500,000	Tottenham (3rd)	350,000
Copenhagen (2nd)	2,500,000	Marlborough	100,000	Tottenham (4th)	1,000,000
Coventry	600,000	Mayence, Germany	700,000	Tottenham (5th)	1,000,000
Coventry (2nd)	600,000	McKeesport, Pa.	500,000	Tunbridge Wells	1,000,000
Cracow, Galicia	200,000	Merthyr Tydfil	300,000	Utrecht, Holland	1,000,000
Crefeld, Germany	500,000	Middlesbrough	1,250,000	Utrecht (2nd)	1,000,000
Croydon	1,250,000	Nelson	400,000	Verviers, Belgium	1,000,000
Croydon (2nd)	625,000	Newburgh, N.Y.	600,000	Vienna	3,500,000
Croydon (3rd)	625,000	New York	5,200,000	Waltham	400,000
Deventer, Holland	150,000	Nictheroy, Brazil	250,000	Wandsworth & Putney	1,800,000
Deventer (2nd)	200,000	North Middlesex	150,000	Watford	300,000
Dorking	150,000	North Middlesex (2nd)	200,000	Watford (2nd)	350,000
Dublin	2,000,000	North Middlesex (3rd)	75,000	Wiesbaden, Germany	850,000
Dublin (2nd)	2,000,000	Norwich	1,000,000	Wellington, N.Z.	350,000
Dublin (3rd)	650,000	Norwich (2nd)	300,000	West Ham	1,500,000
Dundee	1,500,000	Nuneaton	125,000	West Ham (2nd)	800,000
Dunedin, N.Z.	150,000	Oberhausen, Germany	175,000	Weston-super-Mare	350,000
Dunedin, N.Z. (2nd)	275,000	Ostend, Belgium	100,000	Weston (2nd)	350,000
Durham	200,000	Ostend (2nd)	200,000	Wexford, Ireland	100,000
Düsseldorf, Germany	1,000,000	Perth, W.A.	125,000	Winchester	225,000
Eastbourne	1,250,000	Poole	1,500,000	Winchester (2nd)	125,000
Edinburgh	2,000,000	Port Elizabeth, S.A.	400,000	Zwolle, Holland	200,000
Epsom	225,000	Portsmouth	1,000,000	Zwolle (2nd)	200,000

AND SINCE JANUARY 1st, 1908.

G. L. & C. Co.—Fulham (2nd)	750,000	Brentford (2nd)	850,000	Wolverhampton	1,500,000
Ilford	650,000	St. Albans	700,000	Frankenthal, Germany	175,000
Malines, Belgium	500,000	Torquay	350,000	Cracow (2nd)	200,000
Louvain, Belgium	800,000	Lemberg (2nd)	500,000	Oldenburg, Germany	200,000
Hampton Court (2nd)	600,000	Bremen (3rd)	850,000	Croydon (4th)	550,000
Courtrai, Belgium	250,000	Southampton (3rd)	600,000	Berlin—Tegel (2nd)	6,350,000
Vienna (2nd)	2,500,000	Leiden (2nd)	575,000	Stettin, Germany	880,000
Allenstein, Germany	200,000				

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EDITORIAL NOTES—GAS, &c.

Visit of Members of the Société Technique du Gaz.

THE rule of amity and concord is much to be preferred to the rule of arbitrary or unconciliatory strength, or of any other form of supremacy however it may be moulded. This all of us must have recognized in our daily lives; and what is true in the walks of the individual is true in no less a degree in the affairs of national status. Our King has taught the lesson to the whole of the civilized world. He has done more by the olive branch than any other potentate has ever succeeded in accomplishing by the sword and by armies. The lesson should not be lost upon us in the affairs of less magnitude in our daily lives. Many men associated with the British gas industry were, in the early part of last week, engaged in furthering, though in relatively a small way, the work that King Edward has so well accomplished. The visit to London of some eighty members of the Société Technique du Gaz en France, accompanied by some twenty of their ladies, gave the opportunity, and of the opportunity the fullest advantage was taken; and we know there will be complete endorsement when we express the gratitude of the whole of the British gas industry to those who, with warmheartedness and magnificence, welcomed and entertained, and so contributed to enjoyment and impressions, and sank deeper the foundations of friendship. The Gaslight and Coke Company, Mr. Corbet Woodall and Mr. H. E. Jones, the President (Mr. Thomas Glover) and the Council of the Institution of Gas Engineers, and the Bournemouth Gas and Water Company, all took part, and each part was well and truly performed. It would not be the desire of the prime movers in reception and entertainment that we should say more than this; but of this we are assured by M. Coze (the President of the Société up to the close of the visit), by M. Godinet (the new President), and by many of their colleagues, that they carry away with them from our shores memories that on their part will be indelible.

It is perfectly true that between the gas technical societies of France and Great Britain there has been an unbroken bond of friendship. The estrangement produced by the oscillation of events along the political road has never been allowed on the ground where nothing is known but community of professional interests. When the French gas engineer has met the British gas engineer, or *vice versâ*, never has there been anything recognized but the tie of a common interest. Yet, *amor patriæ!* Whatever our calling, however common the professional interests, we are all units of one nation or the other; and it would be extraordinary if professional interest could subdue entirely all emotions raised by national affection. But France has clasped firmly the hand of friendship held out to it; the sons of France serving its gas industry are typical of the responsiveness. The events of the early part of last week have established confidence and friendship more securely than ever between the executive workers of the gas industry of France and this country; and there will be a desire that from now there shall be a still greater display of mutual interest. The memories of the visit will be abiding both on the part of those who honoured the British gas industry by coming from France, and on the part of all of the British gas industry who had lot or part in welcoming their French friends. The influences of the visit will go far beyond the lives of the hundred or so ladies and gentlemen who were of the party. This is certain; for the eloquent acknowledgment made on all hands came from the heart, the lips only giving it form.

But the whole of the three days were not devoted to social intercourse. Between the receptions, there was much to be seen and done. At the Franco-British Exhibition, there was a great deal to be inspected. The suite of apartments that have been fitted up by the Gas Section Committee gave much pleasure to the visitors; the delicate fittings and general appointments of the rooms being compatible with their tastes. But the complaint was made by one French gas engineer that he was unable to get as much gas literature at the exhibition as he was able to get electrical literature; and it did not strike him that this was right. It is not. "But it is all a question of money, *mon bon ami*. "Many like to reap the fruits of what others sow." There was also the high-pressure gas lighting, which was pronounced good; and one who had been to Berlin, and had regarded the high-pressure lighting there as matchless, awarded freely to the high-pressure lighting at the exhibition the palm for efficiency. Gas-works were also visited. The Nine Elms station of the Gaslight and Coke Company being one. What struck M. Coze most of all there was the fact that horizontal retorts variously worked, inclined retorts, and carburetted water-gas plant are all found at this station, and that preparations are now being made for a trial of the Woodall-Duckham continuous system of carbonizing in vertical retorts. Father though he is of the inclined retort, M. Coze gave his blessing to the vertical retort system, and wished it an abundant success. M. de Brouwer, the inventor of the simple coal-projector that bears his name, personally at Bournemouth the following afternoon wished the inventors of the continuous system of carbonization all success. M. Coze and M. de Brouwer are gas engineers; with them self-interest or prepossession are not allowed to stand in the pathway of advance. In putting to the test that which claims to be advance, the Gaslight and Coke Company are taking their part, now more than ever they did in days past and best forgotten. It is only right and proper the Company should do this. Their position demands it of them. As just intimated, the visitors also journeyed to Bournemouth to inspect the new gas-works at Poole, and to enjoy the hospitality of the Chairman and Directors of the Bournemouth Gas and Water Company, but above all to see in actual working the latest developments of the continuous system of carbonization in vertical retorts. The mechanically operated parts of the trial setting at Poole were working well; and the results were equalling the test figures incorporated in Mr. Harold Woodall's Institution paper. The visitors were delighted with the system, and with the freedom with which they were permitted to investigate it. Continuous feed and continuous discharge, in the opinion of not a few of them, constitute an ideal method for coal carbonization for the production of gas; and in the future of gas manufacture, it is destined to take a prominent place. We sincerely hope so; time, of course, alone can show.

Raising the Efficiency of Workmen.

MUCH has been written and much spoken on the question of the training of gas engineers; but what of the training of workmen? This is a subject that spasmodically comes to the front; and it is again being revived, it is to be hoped with permanent result. But it is one that requires to be discussed with discretion, and with consideration for the feelings of those old, skilled, and valued workmen who have not had the advantages that are open, and are being thrown open with still greater lavishness, to those who will in the natural order of things succeed them, or who will be called to their aid through the growth in the demand for specialized labour. To those skilled and valued workmen, let us say that no amount of special education and training under the new order of things can supplant the experience that they have gained through a life of honest work. The difference, in the matter of training, between them and those who are to follow them, is a product of the vast change in the character of the work demanded in the gas industry. The men of long experience have had the advantage of living and working through these changes—from a simple condition of things to a state in which requirements are of a more complex nature; and their experience has thus been shaped and matured with an almost unconscious progressiveness. Something special has now to be done for the boys and

budding craftsmen to compensate for that unique experience that their seniors have obtained through circumstances that cannot be now repeated.

In another part of the "JOURNAL," there appears a report by the Education Committee of the London County Council on a scheme propounded by the Gaslight and Coke Company for giving boys an opportunity of obtaining a proper training in gas-fitting, and making them efficient in the art, under the circumstances of to-day. Much has been done for the technical instruction of plumbers; and sanitary needs claim this. The same should be done for gas-fitters; the efficient service and utilization of gas (quite apart from the activity of competitors) claim this. The simple piping of a house that sufficed at one time of day, when gas was practically only used for flat-flame lighting will no longer do. In the fitting-up of a modern house, the fitter should himself be quite capable of designing a system of piping that will serve not the one simple end of feeding flat-flame burners, but of giving an adequate supply at suitable pressure to incandescent burners, to gas-fires, to cooking-stoves, and to appliances used for other purposes both in the household and factory. The gas-fitter of thirty years ago was not expected to know much about the utilization of gas. A flat-flame burner then was a flat-flame burner, and nothing more; and if it gave a good shaped flame, and was not a "roarer," the gas-fitter whose opinion was asked as to its efficiency had no fault to find with it. The incandescent burner, in all its many forms, is with us now. The gas-fitter should know the functions of the various types; and the necessary conditions for obtaining the best effects and results. Illumination, too, is another matter that he should study, in order to be a good judge of the necessary points of lighting and the most suitable burners both for purpose and situation. Our experience assures us that many gas consumers have a greater preference for what they believe to be the practical advice of the man with the tool-bag than of the superior whose general appearance betokens very distant acquaintance indeed with the gas-pliers. People have fancies and opinions. Gas suppliers have to deferentially respect those fancies and opinions; and those who assist their men to qualify themselves for both intelligent advice as well as performance are serving their own interests. Gas-fitters, too, should be good judges of gas-fires, of the proper fitting and regulation of the most modern kinds; and, if the situation or chimney-draught is unsuitable, they should be qualified to discern this, and be able to report the matter to their superiors so that further action may be taken, before the gas consumer regrets adoption, wishes the gas-fire further, and gets prejudiced against gas heating to such a degree that he will not have any more of his rooms fitted for it. A case comes to mind where a stove was purchased, fitted by the makers in a house in one of the London Companies' districts, and the experience was such that the owner had made up his mind to discard it altogether. The advice was tendered to him to send to the Gas Company to have it put right; and he did so. There are three gas-fires in that house to-day. Equally, cooking-stoves should be thoroughly known by gas-fitters—from their requirements in fitting up to their use, and so forth. The same may be said of all other gas appliances that find place in the household or elsewhere; the objects and efficient working of every one of which should be known to the gas-fitter of to-day.

It may be said that there is nothing new in all this. Even so, we have seen, and can lay hands on, good and bad, intelligent and unintelligent, gas-fitting of quite modern execution. But the point that it is desired to specially make is that the conditions in which the youth of to-day who choses gas-fitting as his work in life enters upon the rudimentary stage of that work are altogether different from those of the fitter who entered into the field when requirement and use were limited, and not of the varied order of to-day. Therefore the necessity for special training. The Governor of the Gaslight and Coke Company (Mr. Corbet Woodall), at the last meeting of the proprietors, called attention to the project the Board had before them for providing facilities for the complete and special training of their fitters of the future; and more is learned of that project from the report of the Education Committee of the London County Council (p. 53). It carries us a big step beyond the old apprenticeship system for turning out skilled craftsmen, and shows a full appreciation of the altered conditions and requirements of the present time. A special and comprehensive workshop training in the technicalities of gas-fitting is at the head and front of the scheme, with a subsequent experience with fitters on the district itself. But, beyond this, the Company have sought the co-operation of the County Council to give these lads (who will be recommended for the Company's workshop training by the County Council), for certain hours of the week, at the Westminster Technical Institute, education in elementary science and other subjects bearing upon their occupation. There is to be encouragement, too, beyond the prospect of thus attaining efficiency as craftsman at only the cost of energy and willingness. From the very beginning of the two years' course of training, the boys will be paid 2s. 6d. a week, with the prospect, if they prove aptitude and efficiency, of having regular employment with the Company at the end of their training. The details of the scheme may be gathered from the report. Consideration of the matter, and of the conditions and needs of the times, will show that what the Company are doing is worthy of emulation. Of course, much the same thing is being done by other gas undertakings, although not in the special and definite manner outlined in the report. The South Metropolitan Company and the Bournemouth Gas and Water Company are examples of gas undertakings who are devoting themselves to this question of affording their workmen special facilities for increasing competency and usefulness in their work; and no doubt many others are doing the same thing. The largest of gas undertakings, of course, are in a favoured position in this matter; having in their own districts the places where technical instruction supplementary to the workshop can be readily obtained. However, the training of workmen, under the changed circumstances, is a matter the importance of which cannot be over-rated; and it would be very useful if readers who are engaged in any schemes of the kind would give an account of what they are doing, and as to their experiences, in these columns.

The man who works only by rule-of-thumb, and does not exercise intelligence, the man who says "this will do" when it is not of the best, the man who is inefficient for the requirements of the times, the man who is not conscientious in the matter of his employers' interests, is not the man for to-day. We cannot forget, in this connection, a statement made by the Right Hon. John Burns some time since, when distributing the prizes at a London Polytechnic. It was to the effect that the data that had come before him as President of the Local Government Board had convinced him that a great majority of the unemployed came from the ranks of the unskilled, and that, in his opinion, the technical instruction of workmen would do more to reduce the number of unemployed in normal times than anything else that his experience enabled him to conceive.

Economizing Artificial Illuminants.

THE second reading that was accorded by the House of Commons to the Daylight Saving Bill, and its reference to a Select Committee, were regarded as big jokes by some of our Legislators. But the jokes and their object have been well sounded; and the latter has been found to have a very practical ring about it. The Committee, if anything, entered on the consideration of the project with somewhat sceptical feelings as to being able to get the evidence of anyone but a few good-natured enthusiasts in favour of putting the hands of the clock on for the six light months of the year, and putting them back again during the darker six months. But to their surprise, nearly the whole of the evidence has been the other way about. Leaders in science, industry, commerce, and in the railway world have come plentifully and willingly before the Committee; and very few have shown any aversion to the scheme. The Committee themselves have become converts. They are satisfied that the idea is a practicable one—that the greater employment of daylight in the summer months will mean health for the people and considerable economy for industry, trading, and in the household.

The greatest economy will be in artificial illuminants. But it is only when the estimated economy is seen in the aggregate that it assumes an aspect of seriousness; otherwise, individually, the purveyors of artificial illuminants will not, so precedent suggests, suffer any grave disadvantage. But it is, of course, a matter of more or less speculation at the present time, under the conditions prevailing in this country. The first year there may be a noticeable difference in the consumption of artificial means of lighting, but not afterwards, when people have settled down to the change. However, there can be no substantial objection to the scheme on the score of this economy. The common interests must have precedence of individual interests; but

those who have any fear of loss of gas profits, diminished dividends, and lower market values for stocks have only to put their gas holdings up for sale, at a small sacrifice, and someone more sapient than themselves will be sure to snap at them.

The Committee have not adopted the cumbersome process of the projectors, of making the change in time by four successive twenty-minute instalments on the Sundays in April, and to return to the old time also by four changes in September. The eight changes in a year have always appeared to us to be a conspicuous example of how to introduce complication into something that is extremely simple. The Committee advise the House of Commons that the change shall be but one hour forward on the third Sunday morning in April; and one hour back on the third Sunday in September—thus simplifying matters considerably. It is not considered that the Bill will be passed into law this session; though the promoters, now that they have gained so much advantage, are showing a thorough belief in striking the iron while it is hot.

The Alkali Works Inspector's Annual Report.

Yesterday there was issued the forty-fourth annual report of the Chief Inspector of Alkali Works. Though a glance at the title might not lead a casual observer to suppose that the book would contain much that would be interesting to makers and suppliers of gas, all our readers know that since the position of Chief Inspector has been held by Mr. R. Forbes Carpenter the annual reports are not merely statements, in more or less stereotyped phrases, of routine duties discharged by him and his band of District Inspectors, but records of important investigations carried out in connection with industries allied to those directly concerned. We are not able to-day to do more than dip into the report; but the portion noticed elsewhere will be followed by a further, and perhaps an even more interesting, instalment. It is gratifying to find that of the total quantity of sulphate of ammonia produced in the United Kingdom the largest amount comes from gas-works, 165,474 tons having been produced last year, compared with 157,160 tons and 155,957 tons in 1906 and 1905. At the same time, coke-ovens are increasing their output; the quantity derived therefrom having risen from 30,732 tons in 1905 to 53,572 tons last year—an increase of 22,840 tons. In dealing with the quantity of coal carbonized in the United Kingdom, Mr. Carpenter was rather hampered by the antiquated Board of Trade returns available—viz., those for Dec. 31, 1905, and March 25, 1906. Those for 1906-7 will doubtless be issued some day. Meanwhile, Mr. Carpenter estimates that some 15¾ million tons of coal were carbonized in gas-works last year. The whole report is full of interest.

Municipal Franchise for Companies.

Attention has on several occasions been called in our editorial columns to the injustice of mercantile corporations and companies being denied voting power at municipal elections, though they are among the largest ratepayers. This unfair condition of things will be remedied if a Bill which was introduced into the House of Lords by Lord Avebury on Monday last week is allowed to go through. It is pointed out that the question of the municipal enfranchisement of companies working either under Special Acts of Parliament or under the Companies Acts is becoming more important every year; and it is considered that, having regard to the enormous increase in the rates which has taken place in nearly every district in the United Kingdom, the time has arrived when the anomaly of payment without representation should cease. It is estimated that in the largest cities companies pay one-third of the rates; and yet they have no votes. The views of 1552 of the leading companies—comprising 93 gas, 35 electric light and power, and 21 water companies—have been ascertained; and they show how widespread is the desire for municipal franchise. According to Lord Avebury's Bill, where a joint-stock or other company are in the occupation of any land or tenement of the annual value of not less than £10, an officer of the company is to be entitled to be entered on the register of electors, and to have a vote at any election except one for a member to serve in Parliament. An officer authorized to vote on behalf of a company is to make his claim on the prescribed form, and forward it, on or before the 25th of July, to the assessors of the parish in which the vote is claimed.

The General Federation of Trade Unions.

During the past week, labour questions have been receiving attention in the City of Oxford, through the holding there of the Ninth Annual General Council Meeting of the General Federation of Trade Unions. It is true that much of the business transacted was of a private character, relating to matters of internal organization and policy; but in opening the proceedings, the Chairman (Mr. Pete Curran, M.P.) delivered an address to the hundred or so delegates in attendance, in which he dealt with points of interest to the general body of members. The total membership of the body at the present moment is 689,674; and there are 122 societies affiliated. The number of disputes in which they were concerned during the past six months was 585, in which 16,601 members were involved; the benefits paid out having amounted to £51,205. For the major portion of this outlay, the engineers' dispute on the North-East Coast has been responsible; and in touching upon this matter, Mr. Curran delivered himself of a short grumble which was by no means justified. After remarking that, whether or not they all believed that the struggle had been carried on legitimately, they were prepared to back the men against enforced reductions of wages, he went on to say that when there was depression in trade the first thing the employers did was to give the men notice of their intention to lower the rate of pay. "Some of them," he continued, "believed that, before this notice of reduction should be issued, the profits might suffer slightly; and returns on invested capital should suffer before wages. If employers were prepared to even share in the sacrifice during trade depression, it would prevent a good many of the disputes such as they had had in recent times." The suggestion that employers do not share in the losses occasioned by slackness of business, will be a novel one to the majority of people; for there has hitherto prevailed a very widespread belief that trade depression was not a matter that affected the workers alone. On further consideration—and possibly after a chat with some of the shareholders in large industrial concerns—Mr. Curran himself may be induced to take this view, and to agree that the impressing of it upon the employees might be of some little assistance in the direction of preventing disputes in cases where falling profits make some curtailment of wages not merely fair but necessary. Among other business was the passing of a resolution viewing with satisfaction the introduction of a non-contributory old-age pension scheme, and confidently anticipating that amendments in the age limits and qualifying conditions would speedily be brought about. Judging from the various speeches made, the Labour Members of Parliament have the strong support of their followers in insisting upon regarding the present proposals as nothing more than an instalment of an ultimate scheme.

Capital and Labour at the Pan-Anglican Congress.

Two of the subjects in which "JOURNAL" readers are interested that were dealt with by Section A—devoted to the "Church and Human Society"—of the recent Pan-Anglican Congress (to whose work brief reference has already been made) were "Capital" and "Labour," the consideration of which occupied a whole day's sitting. On the former topic, Canon H. S. Holland said that because labour was utterly dependent upon capital, it demanded a voice in saying how that capital should be used. The only power by which labour had been able to face this enormous force was Trade Unionism; and there was a large world outside the reach of Trade Unions. Therefore the power of the Municipality and the State must be brought in. How, he asked, could capital be moralized to serve the welfare of the whole? In introducing the subject of labour, the Bishop of Glasgow, who occupied the chair, remarked that in many ways this question was one of the most urgent of the day; and one of the most difficult aspects of it was that, though the interests of capital and labour were identical, yet at any particular point they were apparently opposed. Canon Stephen pointed out what had been accomplished by the Labour Party in Australia. He said they moulded and directed legislation on all matters concerning their welfare; and nowhere was there a nearer approach to social justice. The eight-hour system was firmly established, and was found beneficial; old-age pensions were in successful operation; sweating had been almost abolished; and a hopeful attempt had been made to put an end to strikes by means of wages boards. The higher wages given improved the

quality alike of the worker and the work. During the discussion, we are pleased to see that Sir George Livesey took the opportunity to proclaim once more his belief that the only solution of the matter is to make capital and labour partners. He declared that Socialism would be the end of everything, and that he put no trust in Parliaments; while conciliation and arbitration were as useless as legislation. Among all the remedies for the existing state of affairs that have been proposed, Sir George has one that has been tried, and found successful.

NOTES FROM WESTMINSTER.

A "Sliding-Scale" with Maximum Prices. The sliding-scale in the case of gas companies only applies where there is a standard price—the shareholders and consumers gaining in accordance with the amount of the charge below the standard. Both lose when it is above. There is fairness in this. In the London and District Electricity Bill that has just passed a Committee of the Lords, there appears a clause which permits the payment of increased dividends when the maximum prices allowed for electricity are not charged. The clause runs:

> If in any year the revenue obtained by the Company from the supply of electrical energy is less by 1 per cent. or more than the revenue which the Company would have obtained if they had charged for such energy the respective maximum prices set out in the second schedule to this Act, the dividend which the Company may pay in respect of that year may be increased above the standard rate to the extent of one-quarter per cent. on the paid-up capital of the Company in respect of every 1 per cent. by which the revenue so obtained by the Company has been less than the revenue which the Company would have obtained by charging such maximum prices for such supply.

There are shareholders in maximum price gas companies who would be pleased if this clause could be applied to them. But it is their own fault that they have not the full sliding-scale (which is preferable); so that they cannot grumble.

Gas Leakages and Electrical Systems. In connection with the same Bill, the Brentford Gas Company asked their Lordships to insert a clause arranging for compensation in the event of injury being done to their gas distribution system by the operations of the Electricity Company, and compelling the electricity distribution system to be so constructed as to ensure that no accumulation of gas can occur. But all the eloquence and pointed argument of Mr. R. J. Neville Neville, the Counsel for the Gas Company, did not avail. The provisions of the General Electric Lighting Acts and the Board of Trade regulations were considered adequate.

Water Bills and Orders—Two Purchase Clauses. Our last reference to the Pontypridd Water Company's Bill did not carry us to the final discharge of the measure from consideration by Mr. Nussey's Committee. Clauses had still to be adjusted; and these have been amended and extended, and in the end several are not recognizable as having had any acquaintance with their originals. The £285,000 capital that the Company are to have authority to raise in connection with their new Llia reservoir and works has been specially ear-marked by the Committee for this purpose; so that the Company cannot devote it to any other object. Another clause has been inserted to ensure a proper and thorough filtration of the supply to render t pure and wholesome for domestic purposes, and to prevent it acting on lead in such a way as to endanger the lives of consumers. The Holderness Water Bill has been before a Committee of the Commons. The Sculcoates and Withernsea District Councils were in opposition—the former requesting the exemption of the village of Preston from inclusion in the area of supply; and the latter for the exclusion of their own area, on condition that they came for power to provide for their own requirements. The Committee seemed to think that the latter was a case of a Council being desirous of running their own "show" entirely unaided, without any consideration for expense. The result is Withernsea has not been excluded, but Preston has been. A Bill to confirm the Stourbridge Water Company's Provisional Order has been before Lord Clifford of Chudleigh's Committee; and a purchase clause has been inserted by agreement—Stourbridge and the surrounding authorities having decided to form a Water Board. The arranged terms of purchase are: The Water Board are to give the shareholders such an amount of 3½ per cent. stock of the Board, redeemable after fifty years, as will secure to the shareholders the maximum dividends to which they are entitled. In addition, the Board are to pay the taxed costs of obtaining the Provisional Order, the reasonable costs of winding up the undertaking, £2000 (in 3½ per cent. stock) as compensation to Directors, and such compensation to officials as, failing agreement, is to be fixed by the Local Government Board. By the same Committee, a Bill to confirm the Sevenoaks Water Company's Provisional Order has been considered; and, on the application of the District Council, a purchase clause has been inserted.

The late Mr. L. G. Mouchel, whose death was recorded in the "JOURNAL" for the 16th ult., left £79,570, of which about £6000 is bequeathed to charities. Deceased was identified with the Hennebique system of ferro-concrete construction.

OBITUARY.

JOHN LAW MILNE.

On the 1st inst., John Law Milne passed away at his residence, Elderscroft, Peebles, at the age of 56 years. He was a son of the late John Milne, and was thus a grandson of the original James Milne who founded the firm of James Milne and Son, of Edinburgh, since turned into a Limited Company. Mr. John Law Milne belonged to the fifth generation in direct succession from the John Milne who was a bell-founder and brass candlestick maker in 1750 in the High Street, or Castlehill, of Edinburgh. Mr. Milne entered into partnership with his father and brother (the latter is now Chairman of the Company) when the works were situated in the Canongate. He was well known throughout the gas profession during the twenty years he remained in active service with the firm, and was frequently consulted on many subjects in connection with the measuring and governing of gas and kindred matters, when his considerable knowledge was always at the service of those connected with the industry. He ceased to take an active part in the business in 1892, but remained a Director until 1904, when he retired to Peebles and devoted his leisure to fishing and other sports to which he had always been attached. The fact that he had withdrawn from the close touch with gas managers had never broken his interest; and he was at all times delighted to have a "crack" with anyone who came to Peebles, and liked to talk over old times and matters connected with gas.

The death took place on the 20th ult. of Mr. GEORGE COX, a Director of the Plymouth and Stonehouse Gas Company. Mr. Cox, who was 73 years of age, was head clerk in the office of the Lord of the Manor of East Stonehouse, and was prominently connected with the affairs of the township. He was a member of the Local Board and Urban District Council, and of other bodies.

PERSONAL.

The Criccieth Town Council had to select a Water-Works Manager from among 166 applicants for the post; and ultimately their choice fell upon Mr. HUGH HUGHES, of Criccieth, in favour of whose appointment there was a large majority.

On Monday evening last week, by invitation of the Lincoln Water Engineer (Mr. N. M'Kechnie Barron) and Mrs. Barron, the members of the Lincoln Municipal Officers' Association visited the city water-works at Boultham. They were conveyed by special cars, and upon arrival were entertained at tea in a large marquee. Mr. and Mrs. Barron were heartily thanked for their hospitality; and after a tour of the works, the President of the Association (Mr. R. C. Minton) presented to Mr. Barron an illuminated address in the following terms: "The members of the Lincoln Municipal Officers' Association, as your colleagues serving under the Council of the City and County Borough of Lincoln, desire hereby to express to you their hearty congratulations on the success which has attended your efforts in connection with the scheme for the provision of a water supply for the city of Lincoln. Your fellow members recognize the enormous difficulties with which you have contended; and they admire the consistency with which you have promoted the scheme for obtaining a water supply from Elkesley, in the county of Nottingham, and they sincerely hope that you may have the honour and the pleasure of seeing a complete realization of this important scheme." In acknowledging the gift, Mr. Barron referred to the work done in connection with the Bill by the Deputy Town Clerk, Mr. W. T. Page. Interspersed with the speeches were a series of well-rendered songs; and altogether a most enjoyable evening was spent.

The completion by Mr. S. S. MELLOR of twenty-five years' service as Manager and Secretary of the Northwich Gas Company afforded the employees an opportunity of recognizing the event and expressing their esteem for their chief. Accordingly a numerously attended gathering took place in the new fitting-shop at the works last Tuesday, under the presidency of Mr. T. T. Hough, the Company's Collector and Cashier, when Mr. Mellor was presented with a solid silver cigar-case, filled with cigars, and bearing a suitable inscription. The Chairman referred to the great growth of the Company's business under Mr. Mellor's management (the consumption of gas having gone up from 18 million to 76 million cubic feet, and its price been lowered from 5s. to 3s. 6d. per 1000 cubic feet, while the shareholders' dividends and the workmen's wages have increased), and called upon Mr. T. Dooley, the oldest employee of the Company, to make the presentation. Mr. Dooley said it was a genuine pleasure to him to respond to the Chairman's call. In asking Mr. Mellor to accept their gift, he sincerely trusted that the good feeling that had existed in the past would continue in the future, and that Mr. Mellor and his family would enjoy happiness, health, and prosperity. Mr. H. Littler, the foreman fitter, and Mr. P. Welbourne, the assistant cashier, supported these remarks; the latter saying that the most pleasing feature of the whole thing was the unanimity with which all the employees had contributed, and thus shown in a practical way their esteem for the Manager. Mr. Mellor said he was so taken by surprise at the way in which the employees had come forward to make the presentation, that he felt he could not trust himself to do more than thank them one and all.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 64.)

THE Stock Exchange had last week one of the quietest and most inanimate periods that it has had for a very long while. The brilliant weather, with its powerful sporting counter-attractions, drew many away from Capel Court; and the closing of Wall Street on Saturday caused a holiday appearance on this side, though the Committee declined to close. The general tendency was flatness in speculative lines and firmness in the best gilt-edged issues; the latter being well supported by those who were desirous of effecting their investments before the liberation of dividends this week enhances the demand. The opening day was very dull, depressed in a measure by movements on Foreign Bourses. All classes, from Consols downward, were affected. The tone on Tuesday was much the same all round; and though the American Market at one time made a stand, it gave way again. On Wednesday, with the turn of the half year, there was some little improvement, owing to demands for investment. Consols advanced $\frac{3}{16}$, and some other choice things were firmer. But nothing came to the aid of Home Rails, which could make no headway. On Thursday, business was, if possible, quieter still; and the only satisfactory feature was the steadiness of the gilt-edged division. On Friday, this attitude was well maintained; Consols improving $\frac{3}{16}$. On Saturday (although general markets were so nearly deserted that the Exchange might almost as well have been closed), another rise of $\frac{1}{8}$ in Consols was scored. In the Money Market, there was a strong demand for the half-yearly window-dressing, and after that was over the supply was superabundant. Discount rates were practically unchanged. Business in the Gas Market was well up to the mark, unrepressed by the general quietude, with a firm tendency inclined to advance. In Gaslight and Coke issues, the ordinary was active and steady. On Tuesday, one bargain was done at 97; but on each subsequent day 98 was touched. The secured issues were quiet; the maximum marking $88\frac{3}{4}$, the preference 107 and $108\frac{3}{4}$, and the debenture $84\frac{3}{4}$ and 85. South Metropolitan was steady and unchanged. The prices ranged from $118\frac{1}{2}$ to $119\frac{1}{4}$. In Commercials, dealings in the 4 per cent. were marked at from 107 to 108; and in the $3\frac{1}{2}$ per cent. at 103 to 104. In the Suburban and Provincial group, Alliance new changed hands at $13\frac{7}{16}$ and $13\frac{1}{2}$, Brentford old at $243\frac{1}{2}$ and 244 (a rise of 2), Brighton original at 207 (a rise of 3), Tottenham "B" at 107, and West Ham at $101\frac{1}{8}$ and 102. The Continental Companies were quiet and unchanged. Imperial was done at from $179\frac{1}{2}$ to 181, European fully-paid at 23, ditto part-paid at from $16\frac{3}{4}$ to $17\frac{1}{4}$, Tuscan at $10\frac{3}{8}$. Among the undertakings of the remoter world, Buenos Ayres marked $11\frac{3}{8}$, Cape Town preference $5\frac{1}{8}$, ditto mortgage $47\frac{1}{2}$, Hong Kong $18\frac{3}{8}$ and $18\frac{1}{4}$, Melbourne 5 per cent. $101\frac{1}{4}$, Monte Video $11\frac{3}{4}$, Primitiva from $6\frac{3}{8}$ to $6\frac{7}{8}$, ditto preference from $5\frac{1}{2}$ to $5\frac{5}{8}$, ditto debenture $92\frac{3}{4}$, and River Plate $13\frac{1}{8}$ and $13\frac{3}{8}$.

ELECTRICITY SUPPLY MEMORANDA.

London Electricity Supply Bills—The Passing of Parliamentary Protection—Failure of the Search for Justification—Security of Decentralization in Generation—The Gas-Engine to the Rescue—Contradictions—A "Simple" Device.

THE passing of the three London Electricity Supply Bills (on terms and with limitations) by Lord Cromer's Committee, does not mean anything more than success in one House; and the measures have yet to face the House of Commons. That House, under the present administrative *régime*, has not looked with grace upon any bulk and power supply scheme that is not municipally begotten. There may not, however, be any objection within its walls to the Joint Bill of the eight Companies and that of the Westminster and Kensington Companies as modified by the Lords; the modification practically curtailing the concerns to intercommunication for aiding each other, and protecting the consumers against failure of supply. And the death sentence upon the proposal of the eight Companies to set up a Joint Committee with authorization to carry out a scheme for supply in bulk and for power, is quite consonant with the views of the municipalizers of the Commons. The London and District Bill, which is to sanction the creation of an altogether new Power Company, is quite another matter; and it is too soon to start predicting its fate at the hands of the Lower House. There is a big risk there; and there is the other risk in the necessity under which the Company will commence operations, if the Bill eventually succeeds, of having to find a fixed proportion of the capital within twelve months, and a rather greater sum than they themselves proposed in the Bill. Electric Power Companies by their record do not stand in a favourable light among investors; and this one comes along rather late in the day. So the position of affairs leaves the horizon of London electricity supply still densely clouded; but should the Bills succeed, the opinion is fairly well based, on common sense considerations, that present confusion in regard to that supply will be worse confounded.

In such an event the hardship upon the present electricity suppliers in the Metropolis will be severe. Here is a matter that must be regarded as one of principle and of right; and though the London electricity suppliers are competitors with the gas undertakings, we anyway are not prepared to endorse a parliamentary recantation of protection, unless it can be shown that there has been abuse of legislative privileges or negligence of, and non-compliance with, conditions. The existing suppliers have done the pioneer work, have spent money in establishing and developing their services, the public have invested on the strength of parliamentary protection, no case has been made out for interference with them, and no case has been made out that any fresh company is necessary in the public interests for competing with them for one part of their business. Even the local authorities owning electricity supply undertakings, assuming that no question of purchase came in, could not have opposed the joint companies' scheme on the grounds of abuse of privileges, negligence, or non-compliance with parliamentary powers. Had they done so, they would, inferentially, have given strong support to the case of the London and District Company's scheme. If this Company's Bill succeeds, not only will it do injury to the businesses of the existing undertakings—company and municipal—as they stand at present, but the difficulties that will supervene will make the conditions of the working of these undertakings in future still more onerous. The leases under which the Companies are working are getting shorter year by year; and with a competing Company in the field, they will find that capital will not be so readily forthcoming. Parliament will, in fact, by putting this competition upon them, be laying an indefensible burden upon the Companies and those who patronize them. In fine, Parliament will be giving active assistance to the destruction of something that Parliament itself created. It is not right.

Where is the justification for setting up a large competing Company? Mr. James Falconer gave the best of reasons why it should not be allowed when he stated the grounds on which the promoters of the Administrative Company's Bill dropped their scheme. The existing suppliers have come down in power prices (as we have said before, we say again, rightly or wrongly) to a level at which no competing power company can hope to carve out of London a remunerative business. On the contrary, the clear prospect, under current conditions, is that such a Company would cause a great deal of unnecessary annoyance in London, weaken the earning power of a large amount of capital, fail to attain a lucrative end themselves, and serve no sufficiently utilitarian purpose. It is proved that the existing suppliers are offering electricity for power at remarkably low prices, and they are active in trying to obtain power business; but the manufacturers are not very responsive to their importunities. Nor do they find in their respective districts that the average power requirements of the manufacturers are anything like the averages the promoters of these special power companies have put forward in support of their schemes. Assuredly, too, there is no occasion for any heavy capital expenditure on an additional distribution system; the systems in existence being ample for all the power requirements of manufacturers within the metropolitan area. In furnishing generation costs to the Lords Committee on behalf of the London and District Bill, there was not sufficient point made of the fact that the capital and other expenses of distribution ought to be taken into account whenever comparing existing conditions and centralization.

In opposition to the London and District Bill, and in favour of linking-up the present stations, a strong point was made of the security attaching in electricity supply to decentralization. There is no doubt that new electricity stations in good areas will hereafter be built in larger units and of larger individual capacity; but still there will be greater safety where all the eggs are not carried in one basket. We have been twitted for making a point, from the position of competitors, of the security of the supply of gas contrasted with that of electricity supply. The failures there have been of electricity supply—the last one at Liverpool for example—have been irksome for the purveyors; but they have short memories as occasion demands. Here in the evidence against centralization and in favour of intercommunication, it was pointed out that it is a common thing for supply to be given by alternative routes, and that it would be better for the electricity supply of London to be dependent on a number of different stations, between which there is connection. "In the event of one station being entirely wrecked," said a witness, the supply would not then be materially affected. The boiler explosion at the South Metropolitan Electric Supply Company's works should have been made use of as an effective illustration of the danger of mono-station supply; for the little Sydenham station was useful in that case only in a limited area. But there are more towns dependent on a single station than on a number; and many towns have had dismal experiences as the result. That brings us to another point. Electricity stations are not favoured with the storage conditions upon which gas supply always stands so secure, both in the event of emergency demand and (in gas-works) rare accidents. The result is that electricity supplies have to incur heavy stand-by losses in keeping boilers ready for exceptional flights in demand. The internal combustion engine is, it was given in evidence before the Lords Committee, in consequence coming largely into use; and in the schemes that have lately been before their Lordships, the gas-engine has been incorporated for the taking-up of peak loads and sudden large accessions in demand.

Those who go to the electrical papers to learn the truth regarding the competition of electric lighting with incandescent gas lighting will rise from their study in a quandary. In a letter in

the "Electrical Times," "P.G." admits a well-acknowledged fact, that electric heating has been the greatest failure of electrical enterprise. But lower down in his communication there is the startling intelligence that "electric lamps are almost as common as gas-lamps." The "Electrician" and the "Electrical Review" more than supply the counterbalance to this. The other week, we read in the former paper "the proportion of lighting business which, up to the present, has been obtained by most electricity supply authorities is only a small fraction of the whole, and is certainly incompatible with the undoubted fact (!) that electric lighting is now as cheap as incandescent gas lighting." We can afford to let the latter part of this statement pass at present; it is only the refutation of "P. G.'s" imaginative assertion with which we are concerned at the moment. Perhaps, however, if "P. G." is not disposed to accept the declaration of the one paper, he will reconsider his statement on learning that the "Review," in some notes on their annual tables, state that they have noted with interest comments on the part of several central station engineers to the effect that their percentage increase of connections has been reduced to a small, or even to a negative quantity, by the general adoption of the metallic filament lamp. The allegation that electric lamps are almost as common as gas-burners may, we think, be challenged, without much fear of raising any protracted contention.

There was an interesting page in the "Daily Mail" recently; for on the page were found two articles that attracted attention. The one was headed "A New Blarney Stone," and the other "Cheaper Electric Light—70 per cent. Reduction—Simple Device." There were two or three columns separating the articles. That was a mistake; they should have been printed side by side. It was a clever piece of work to get the Editor of the "Daily Mail" to give in the second article an (apparently) free advertisement to something that is not new, not even the exaggerations, in connection with electric lighting. But after all perhaps the word "clever" is hardly the correct one, when the record of the "Daily Mail" for sensational announcements that have come to naught is remembered. The simple device turns out to be nothing more than a transformer for reducing normal supply voltages to about 25, in order that new metallic filament lamps of the lower illuminating powers and consumptions may be used. The makes of such transformers are now legion. But there is included in the article a comparison between gas lighting and "transformed" electricity used with metallic filament lamps, the faults of which comparison even the Editor of the "Daily Mail" should have been able to readily detect. Here it is:

Incandescent Gas Lighting.

No. of Burners.		Consumption per Hour.		Price per 1000 c.f.		Cost per Hour.
6	..	28 c.f.	..	3s.	..	1d.

Metallic Filament Lamps.

No. of Lamps.		Consumption. per Hour.		Cost per Unit.		Cost per Hour.
18 10-candle power	..	180 watts	..	5d.	..	¾d.

The ¾d. is a bit short, and the 1 watt per candle power ditto; but let these deficiencies pass. The stupidity of the comparison can be shown in a trice. By modern inverted gas-burners, a low illuminating efficiency per cubic foot of gas an hour is 20 candles. But adopting it, $28 \times 20 = 560$ candles; $18 \times 10 = 180$ candles. And the "Daily Mail" published it! And the Editor of the "Hastings Observer," with charming simplicity and confidence, copied it into an "editorial." Even the editors of the electrical papers have been shaking their sides with laughter over the free advertisement, and the statements it contains.

The High-Pressure Street Lighting in Berlin.

In the last and immediately preceding issues of the "JOURNAL," reference was made to the street lighting in Berlin. The members of the Institution of Gas Engineers who visited the city after the recent meeting were struck with the fine effect produced by the incandescent gas-lighting, which is exclusively on the "Millennium" high-pressure system; and those who were unable to inspect it personally, as well as our readers generally, may be interested in the following additional particulars. As previously mentioned, there are two stations, one of which consists of an installation of five "Millennium" plants, each worked by a Körting gas-engine. Three of these plants compress 9000 cubic feet of gas per hour each, and the other two 18,000 cubic feet each. In the second station there are three "Millennium" plants, each of 18,000 cubic feet capacity per hour. For the sake of trial, the second station was provided with one "Pharos" and one "Colonia" apparatus, each having a compressing capacity of 3500 cubic feet of gas per hour. But, after trial, they were put out of use, and are now only employed for a few minutes each day so as to assist the "Millennium" plant when filling up the services. A further "Millennium" apparatus is being put in the second station; and an entirely new station is being built at the Berlin Gas-Works in Müllerstrasse, consisting of three of the "Millennium" plants of 18,000 cubic feet each. The three stations will then be connected to the same service. The lighting of the whole of the vertical and inverted burners is done automatically by special valves; and in a few minutes after the pumps have started working, the whole of the streets in the city are spontaneously flooded with light.

PRACTISING GAS ENGINEERS & CONSULTANTS.

[COMMUNICATED FROM AMERICA.]

THE letters relating to the Nuneaton Gas Company's affairs, that occupied much of the "JOURNAL" correspondence columns in May, serve well to indicate some striking differences between the gas industry of Britain and of the United States. To begin with, our gas papers are practically devoid of correspondence; and therefore the exchange of ideas between gas men is confined to Association meetings and to personal interviews and correspondence. Why we do not write and you do, is probably attributable to a variety of causes—among them being difference in national temperament and in the character of the gas journals. We apparently avoid some chances for disputes, with the occasional resulting hard feeling; but we also lose the benefit of some very useful information, judging from the contents of the letters you publish, year in and year out.

Again, the reason for the Nuneaton letters could hardly have arisen in this country. The largest single interest in control of gas-works properties—to wit, the United Gas Improvement Company—will not permit any of its employees to engage in outside consultant work. They take the ground that they are paying for the entire working time of the employee; and that any hours outside of those usually allotted to work, that might be spent in the service of outside interests, for the sake of extra income, would involve a diminution in the stock of energy available for the employee's regular work. The stand thus taken is broadly typical of American conditions; and in most instances the logical consequences are met—viz., the employee is paid an adequate salary. The idea of paying a small salary because permission is granted to do outside work, has taken little root here in the gas business; and in this, as in other respects, gas men are differentiated from the Pullman car porters and restaurant waiters, whose salaries may be nominal because of their tips. In those cases where employees are allowed to do work for outside companies, while undoubtedly the fact that this permission is given (more especially if a good pecuniary return ensues) is considered in connection with any future increases in salary, yet the starting salary is practically uninfluenced.

As to the use of an employee's ideas by his company, practice here varies a good deal; but, in general, it may be said that the employee does not profit by his ideas as much as does his company. Some companies compel each employee to sign an agreement conveying to the company all rights to any of his inventions; and what they may give the employee in the way of increased salary, or other money payment, because of a valuable invention, will in that case depend upon the tenderness of the corporate conscience. It is beginning to be felt, however, that a fairer way of handling this question is to require of the employee only the free use of his inventions for the company's own plant, and leave him all profit arising from other use. He would not be allowed to take an active part in manufacturing or selling his inventions—being obliged to hire others to do this for him.

The result of preventing employees from doing outside work has apparently not resulted in a larger number of consulting engineers here as compared to Great Britain, if one may judge of your conditions by the names known through your advertising pages and valuation proceedings. It probably causes more dependence on the apparatus manufacturer, and acceptance of his specifications, than is true under your conditions. There may easily be two opinions as to whether this has been beneficial or otherwise. A reason which explains the comparative lack of consulting engineers in this country, is that until recently there was no field for them, such as has been constantly afforded with you in the valuation of gas properties, prior to taking over by municipal corporations. Under the new *régime* of State Commissions, there are now arising occasions for valuation; and, in general, the profession of consulting gas engineer has been made much more attractive in recent years from the increased demand for the services of a consulting engineer by gas companies amenable to Commissions. So far, the governmental authority—whether City or State, official or commission—which has desired expert advice in making any investigation of a gas company's affairs, has been unable to secure the services of any recognized gas engineer. This has been absolutely true except in one or two isolated cases, which, as exceptions, only emphasize the rule more strongly. Therefore, it has happened that the experts on which a City or State has relied to justify a price reduction, have been usually Mr. "B," who is the superintendent of a water-works, or Mr. "M," who used to manage an electric light company. As neither of these men has ever operated a gas-works, it is not to be wondered at that their testimony, singly or united, has generally failed to impress the higher courts, even though satisfactory to their partisan employers. It has been this partisan attitude of the governmental body that has prevented reputable gas engineers from accepting a retainer against a company. Fortunately, there are now many indications that the existing State Commissions are composed of fair-minded men, and that in serving as their adviser, a gas engineer can feel he is not proving a traitor to his profession, but, on the contrary, benefiting the gas companies taken as a whole, by educating the Commissioners along rational lines. If this proves to be true, there will be a new field here for the consulting gas engineer.

VISIT OF THE MEMBERS OF THE SOCIÉTÉ TECHNIQUE DU GAZ.

GLORIOUS weather prevailed the whole of the time the members of the Société Technique du Gaz en France were in this country last week; and the good conduct of the weather, of course, greatly enhanced the pleasure that they derived from their stay here as the guests of representative friends of the British gas industry. Their welcome by Mr. Corbet Woodall and Mr. H. E. Jones, at a luncheon at the Garden Club of the Franco-British Exhibition on Monday (as reported in last week's issue) was only the beginning of a series of items in a liberal programme composed of sight-seeing and social entertainment. Crowded with events were the days; but everything passed off with the regularity of clockwork, and much praise is due to the visitors for the assistance they rendered by their punctuality to making the three days the grand success that they were. Those among us at home who had the good fortune to take part in the three days' friendly intercourse, with the goodwill and cordiality at high-water mark the whole time, will treasure with delight the memories of those days; and we are sure, from the fervent expressions heard on every side among our French friends, that our feelings are their feelings.

AT THE NINE ELMS GAS-WORKS.

Having dealt with Monday's proceedings in our last issue, the course of events has to be picked up from Tuesday morning. A few minutes after ten, brakes were in readiness outside Westminster Palace Hotel to take the members of the Société to inspect the Nine Elms station of the Gaslight and Coke Company; and the members were all prepared to start on the day's programme at that hour. The reason that the Nine Elms works were chosen (and not Beckton) was because an engagement of the Committee of the Société with the Council of the Institution of Gas Engineers later in the morning would not have allowed them to have gone so far afield. But those who fancied there would be nothing to be seen at the Nine Elms works were pleasantly surprised in the result. The Nine Elms station is not what it was once; and much of its equipment, as will be shown presently, is of quite modern type. The works and their approaches on Tuesday morning were decorated with the French and British flags, and as the brakes approached, the work's band—and an accomplished band it is too—played the Marseillaise; and at intervals later rendered other selections. The President of the Société (M. Coze), the President-Elect (M. Godinet), and the seventy to eighty members with them, were received by the Company's Chief Engineer (Mr. T. Goulden), Mr. T. S. Lacey (the Station Engineer), and members of the works' staff. The visitors were at once divided into parties, and conducted round by Mr. Goulden, Mr. Lacey, and Messrs. Hornby, Bottle, Valon, and Hilson.

The following are a few notes on the works that were distributed (in both French and English) among the visitors:—

	Cubic Feet.	Cubic Metres.
Daily productive capacity	13,500,000 ..	382,000
,, coal-gas production	10,500,000 ..	298,000
,, carburetted water-gas production .	3,000,000 ..	85,000

Gas is manufactured in seven retort-houses, originally worked by manual labour, but which are in process of being fitted with modern appliances. No. 8 house is fitted with horizontal retorts, 20 feet long (6·05 metres), charged and discharged by De Brouwer stoking machines, deriving their power from an electric generating station within the works. The coke handling and storing machinery attached to this house is also electrically driven. The generating machinery consists of a 85-horse power Westinghouse gas-engine, driving a 55 kilowatt generator (voltage 125). This plant is installed in duplicate. No. 4 and No. 7 retort-houses are fitted with inclined retorts, 20 feet (6·05 metres) long. The latter house contains 24 settings, each of eight retorts; and in it over 300 tons (30,545 kilogrammes) of coal are carbonized per day. Two experimental settings of Woodall-Duckham vertical retorts, in No. 1 retort-house, have been recently demolished; and one setting is now in course of re-erection.

The carburetted water-gas plant consists of three sets, made on the "Lowe" system, and erected by Messrs. Humphreys and Glasgow. The operations of blowing and gas making are conducted respectively in four and six minute periods. The oil-tanks are capable of storing 1,300,000 gallons of oil.

Coal and oil are both brought into the works *viâ* the River Thames; the former in colliers of about 1200 tons capacity, which are discharged by means of Hone's grabs, working from three cranes simultaneously. These grabs raise one ton of coal per lift, and ships are usually discharged in about eight hours. Oil is brought in tank-barges, which are taken into the works, and pumped out into the storage-tanks.

The exhausting machinery is of the rotary type throughout.

The scrubbing and washing plant consists of two Pelouze and Audouin tar-extractors of the latest pattern, followed by naphthalene washers. Cyanogen is extracted from the gas by means of bubbler washers. Ammonia is extracted partly in the old tower scrubbers, and partly in rotary washers of the "Standard" type, made by Messrs. Kirkham, Hulett, and Chandler.

The purifiers are of the ordinary type, with hydraulic lutes. In No. 2 house, containing twelve purifiers, each 40 feet by 25 ft. 6 in., the contents of each purifier may be discharged, when fouled, directly into barges lying in the dock over which this purifier-house is built. Oxide of iron exclusively is used at this station in the purifiers.

The gasholders at this and at the outlying station at Battersea are six in number, of a total capacity of 10,128,000 cubic feet (283,284 cubic metres). They are also in connection with the Company's chief works at Beckton, and can be filled with gas made at that station as well as that made at Nine Elms.

The residual products made at Nine Elms are not treated on the works but are conveyed to the Company's products works at Beckton, where the residuals of all the stations are worked up.

The coal-discharging plant on the Thames is of recent erection. The three cranes are actuated by hydraulic power, and are each capable of lifting 55 tons per hour. The power is furnished by two compound condensing steam-engines of 120-horse power, which also furnish power to the interior of the gas-works and to the hydraulic capstans on the coal viaduct. The coal-waggons are run across Nine Elms Lane over a bridge; an endless chain being used as the means of supplying motive power to them. The whole of the machinery was supplied and made by Messrs. Tannett Walker and Co., of Leeds.

The illuminating power of the gas made at Nine Elms is 16¾ candles, burning at the rate of 5 cubic feet per hour in the Carpenter burner, The restrictions of "sulphur compounds" in the gas have now been removed; but a rule is that not more than 40 grains per 100 cubic feet of gas are allowed to remain in the gas sent out for distribution.

The parties followed one route which had been carefully mapped out by Mr. Lacey; and compliance with plan and times kept the parties well separated—thus avoiding confusion. The engine-house was first visited; and the Westinghouse engines and electrical plant were all much admired. The extensive coke plant came in for particular examination and inquiry; and the information was gathered that the tray conveyor in the yard deals with the coke perfectly, and without breakage. The line of large coke-hoppers (having a capacity of 220 tons) was most interesting to many of the visitors. No. 8 retort-house was inspected, and great interest was taken in the De Brouwer projector, and its efficiency was recognized. The carburetted water-gas generators and carburettors caused inquiry; and the three compound Westinghouse engines and the fans were inspected with pleasure. In the corner of the meter-house, there is a photometer fitted with a Carpenter burner; and the regulation of this was examined with curiosity by many who had not seen one before. In passing the cyanogen plant, there were several interrogations as to the method of operation; and it is evident that interest in cyanogen recovery is fast spreading among our French friends. Retort-house No. 7 was eventually reached. It is a fine building, containing a splendid range of inclined retorts; and M. Coze was naturally extremely interested in them. This house was raised 19 feet to accommodate the settings; and it is airy, light, and the heat anything but oppressive. The stage-floors are very spacious. On the discharging-stage, tools are ranged in orderly manner down the centre, so that there is no impediment and no danger. Order of this kind comes from a rule that has been made to be obeyed; and obeyed it is. The stokers are to be congratulated on the neat and clean appearance presented by this large house. Another feature that aroused some curiosity was that the drip-plates in front of the mouthpieces are all lime-washed; and inquiry elicited the information that this prevents the tar adhering tenaciously to the plates, and enables it to be easily and quickly scraped off. Lime washing and cleaning is a daily morning performance. In one of the dismantled retort-houses, the new trial vertical setting on the revised model of the Woodall and Duckham continuous system was seen in course of construction. But we need not stay here to refer to these retorts, as the system receives further notice in the account of the visit to the Poole Gas-Works of the Bournemouth Gas and Water Company. In No. 4 house, the inclined settings were seen in course of reconstruction. Many other features of interest were inspected; and then the visitors passed over Nine Elms Lane to the Works' Wharf; and, after inspecting the unloading arrangements there, they witnessed a demonstration by workmen in first aid. The men were cheered for the alacrity they displayed in dealing with supposititious injured men. The Works' Institute building was next visited; and there in one of the rooms, beflagged, and with the sentiment "*Vive la France*" prominently displayed on one of the walls, the visitors were entertained to refreshments. Here Mr. D. Milne Watson (the Company's General Manager) and Mr. H. Rayner (the Secretary) came to pay personal greeting to the visitors. Before the company quitted the works,

Mr. GOULDEN mounting the platform, and addressing those present in French, said he understood the time had come when this pleasant gathering must break up; but he should like to detain his friends for a few moments in order to bid them a hearty welcome to the works they had just inspected, and to express his best wishes that the whole of their visit to this country might be as enjoyable as, at any rate, their meeting that morning had been to him (Mr. Goulden). He should have liked them to have seen the Company's great works at Beckton, where half the gas of the Company was made; but time had not permitted of this. They had therefore arranged for this visit to the Nine Elms works as being the most convenient station for their inspection. They would have seen the many difficulties that had had to be encountered in the works, in modernizing old retort-houses laid out many years ago, and in fitting new installations of machinery in old positions which were not best related one to the other. He thought he might fairly claim that the results of the station showed that they had not been altogether unsuccessful in their work. The Governor and the Directors of the Company were especially pleased that they had had the honour of this collective visit of the members of the Société

Technique de l'Industrie du Gaz en France paid to their works. He would not detain them further than to wish the Société all prosperity and success; and he raised his glass and drank to the health of their esteemed President, M. Andre Coze. He trusted to meet them all again that evening, when they would have another very pleasant *réunion* at the Franco-British Exhibition.

M. Coze, in his acknowledgment, said the members of the Société were almost overwhelmed by the delicate attention they had received everywhere. Hardly had they arrived in England when they found in all buttonholes the French colours; and the French National Hymn welcomed them on all occasions. Mr. Goulden, Mr. Lacey, and this gentleman's assistants had taken them through the whole of these large works, and had given them details and explanations of every part of the plant and apparatus that had interested them. They saw every system of carbonizing employed for the manufacture of gas, even to preparations for the vertical retorts on the Woodall-Duckham system. He was very interested, too, to see some 200 of his own little children [the inclined retorts] doing good duty in an English retort-house. They saw how well everything was done in the works to maintain them in a high state of working efficiency, and how great was the attention bestowed upon the machinery. But, above all, he was glad to see the attention that was given to the workmen, and the obvious good relations that existed between the officers and men. Their gratitude was due to the works' band, whose music had been thoroughly enjoyed. When they had seen everything of interest on the works, they were suddenly brought, in the room in which they were assembled, face to face with the words "*Vive la France*." They could only raise their glasses and cry "*Vive l'Angleterre*."

The visitors then left the works to the strains of the National Anthem.

LUNCHEON BY THE INSTITUTION COUNCIL TO THE COMMITTEE OF THE SOCIÉTÉ.

The President (M. Coze) and his colleagues of the Council of the Société had little time to spare before they had to keep an engagement with the President (Mr. Thomas Glover) and the Council of the Institution of Gas Engineers, at the Piccadilly Hotel. It was a small but happy party that there assembled. Sir George Livesey, Mr. Corbet Woodall, Mr. H. E. Jones, and Mr. R. S. Gardiner were among the guests invited to meet the elected heads of the Société. The President (Mr. Glover) presided at the table, having on his right-hand side M. Coze and on his left the President-Elect of the Société (M. Godinet). The Senior Vice-President of the Institution (Mr. James W. Helps) and the Honorary Secretary (Mr. S. Y. Shoubridge) were present; and, among others, Mr. Charles Hunt, Mr. Charles Carpenter, Mr. D. Irving, Mr. D. Bruce Anderson, Mr. Thomas Berridge, and Mr. R. S. Shadbolt.

After luncheon, the toasts of His Majesty the King and the President of the French Republic were honoured. Following

The President said he had to propose the toast of this very pleasant occasion. The gas profession of the British Isles had always regarded the members of the Société Technique as their friends. Even in the days of gloom and mistrust, they as technical men had not allowed politics to interfere with their friendship. Though they were separated by the Straits of Dover or Calais (just as they chose to call them), it had not hindered their friendship; but how much easier it was when their good friends of the Council of the Société Technique honoured the Council of the Institution by their presence, to let that brotherly feeling be understood in its fullest sense on both sides. They wished M. Coze (who was the inventor of inclined retorts), M. Godinet, and their friends on the Council of the Société, to feel that they were their comrades on this side of the Channel, working for the same end—the strengthening of the gas industry; and they wished this occasion to be one to show that, while they were working in the same spirit for that strengthening of their common industry, they were also, it was trusted, indirectly strengthening international love and goodwill. He took this opportunity of congratulating M. Coze upon the success of the meetings that Mr. Helps and he (the President) had had the privilege of joining in the capital city of Paris. He thought M. Coze and his Council were to be congratulated on the quality and the number of the papers, on the interest taken in the discussions, and on the good work done for the industry generally by the annual meeting. The Council of the Institution welcomed the Council of the Société as friends; and they trusted that their friendship would grow more intimate, that their national ideals might come closer and closer together, that in future they might become comrades indeed, and that there might be no room for mistrust and doubt. He and his friends drank to the health of M. Coze and to the prosperity of the Société Technique.

M. Coze, replying in the names of himself, his colleagues, and the members generally of the Société Technique, said he thanked Mr. Glover for the kind words he had used in the name of the Institution of Gas Engineers. They were all most thankful, and indeed much touched, by the cordial reception that had been extended to them. He was glad of this opportunity of greeting Sir George Livesey, Mr. Corbet Woodall, Mr. H. E. Jones, Mr. Charles Hunt, Mr. Carpenter, and Mr. Helps, and the other eminent engineers of the British gas industry who were grouped round the table. He was personally and particularly grateful for the delicate attention of the President, who had mentioned that he (M. Coze) was the inventor of inclined retorts; but he did not forget that it was to Mr. Henry Woodall that he owed their introduction into England. He was sorry to have to beg to be excused for not speaking in English, so that he could express directly and emphatically all the feelings of sympathy that the Société Technique du Gaz entertained for their colleagues of the Institution of Gas Engineers. They counted among the members of the Institution many friends; and they were extremely glad of the honour of being able to count many of them as Honorary Members of the Société. He himself felt very flattered that he had been enrolled an Honorary Member of the Institution. He only knew three words in English; but they summed up his feelings towards his British colleagues: "I love you." Only a few days since, there had been cemented, by the eminent rulers of their two countries, the old feelings of cordial sympathy which united them. He asked them to again lift their glasses to His Majesty the King and to M. Fallières, the President of the French Republic.

Mr. Helps, at the request of the President, thanked M. Coze for the kindly words he had spoken in regard to the Institution. He did not know that he could add anything to what had been said by Mr. Glover. It was, indeed, their wish to establish on a firmer footing than before the feelings of brotherhood and friendship that had ever marked the relations of French and British gas engineers. British gas engineers always felt, when they met a French gas engineer, that they were meeting one who was in accord with them whether in their everyday work or in social life and friendship. He thanked M. Coze most sincerely for the welcome that he extended to the President of the Institution and himself when they had the pleasure of meeting the members of the Société Technique in Paris. He had had the privilege of attending the meetings of the Société in several towns; and he always looked forward to these opportunities with the greatest of pleasure. The anticipation was always more than equalled by the actual feelings that existed whenever they had the pleasure of meeting their French brethren. He could assure them that it would always give the Institution pleasure to see members of the Société in this country, and to do everything possible to aid the friendship that existed between them.

On the invitation of the President, all present drank to the *entente cordiale*.

M. Visinet, in a few words, heartily thanked the Council of the Institution for their kind reception of the Committee of the Société Technique.

M. Godinet (who will be President of the Société for the next two years) said that M. Coze had spoken of the past and of the indebtedness to their English friends for their kindness. He (Mr. Godinet) had one great wish. Next year the meeting of the Société would be held in a provincial town, too far for members of the Institution of Gas Engineers to go. But he hoped that the following year, when the meeting would be held in Paris, that as many members as possible of the Institution would pay them a visit; and he could assure them of a very cordial reception. They could not vie with the great hospitality that had been shown them in this country on the present occasion; but they would do their best to reciprocate those expressions of friendship that had been evinced towards them, and which they so deeply and fully appreciated.

BANQUET BY THE GASLIGHT AND COKE COMPANY.

The same evening there was a brilliant function at the Garden Club of the Franco-British Exhibition. It was a banquet by the Governor (Mr. Corbet Woodall) and the Directors of the Gaslight and Coke Company in honour of the visit. Covers were laid for between 130 and 140 guests. The Governor and four of his colleagues—Sir Hugh Owen, G.C.B., Mr. Ulick John Burke, Mr. John Miles, and Mr. H. J. Waterlow—and with them the President of the French Société (M. Coze), received the guests at the entrance to the dining-room; and on the announcement that "dinner was served," they led the way to the tables—the Governor escorting Mme. A. Martin, the daughter of M. Coze; and M. Coze escorting Miss Woodall. The President (Mr. Thomas Glover) and Vice-President (Mr. J. W. Helps) of the Institution, Mr. H. E. Jones, Mr. R. S. Gardiner, Mr. H. Woodall, and Mr. C. W. Woodall were among the guests. The officers of the Gaslight and Coke Company were represented by Mr. D. Milne Watson (the General Manager), Mr. Henry Rayner (the Secretary), Mr. T. Goulden (the Chief Engineer), Mr. G. F. L. Foulger (the Distributing Engineer), Mr. T. Wilton, Mr. T. Milne, Mr. J. N. Reeson, Mr. T. S. Lacey, Mr. H. Iago, Mr. A. C. M'Minn, Mr. J. Wilton, Mr. R. Birkett, and Mr. F. W. Goodenough. At the top table, to the right-hand side of the Governor sat M. Coze, Mrs. Woodhouse, Sir Hugh Owen, Miss Miles, M. Godinet, Mme. Gautier, Mr. Miles, Miss Owen, M. Marquisan, Mme. Cros, Mr. H. E. Jones, Miss Waterlow, M. Chamon, and Mr. R. S. Gardiner; to the left-hand side of the Governor, Mme. A. Martin *fils*, M. Visinet, Mrs. Figgin, Mr. Ulick J. Burke, Mme. Lhomme, M. Seguin, Mrs. Milne Watson, M. Gaston Gautier, M. Bachelay, Mr. H. J. Waterlow, Mme. Kern, M. de Brouwer, Mr. T. Glover, and Mr. J. W. Helps. Among other English ladies present were Mrs. Goulden and Mrs. Rayner.

Upon the banquet itself, we need not remark. It suffices to say that the Gaslight and Coke Company, as the premier gas undertaking, were the hosts; and that the following was the *menu*, at the top of which were crossed the French and British flags:

Melon Glacé Hors d'Œuvre Russe

Petite Marmite
Bisque de Homard

Truite Grenobloise

Selle d'Agneau Rôtie
Petits Pois. Pommes Rissolées

Ris de Veau Archiduc

Mousse de Jambon Perigueux

Granit au Champagne

Poularde à la Bröche
Salade Française

Fraises Zouave Dessert Café

After dinner, there were a few toasts, and a programme of music by the accomplished "Folk Song Quartette" (Miss Beatrice Spencer, Miss Florence Christie, Mr. Louis Godfrey, and Mr. A. Foxton Ferguson, with Miss Adeline M. Jones as accompanist). The programme was as follows:

I.	"Early one Morning"	*English*
II.	Two Spanish Folk Songs—(*a*) "Arullo," (*b*) "Me gustan Todas"	
III.	(*a*) "Do, my Love, as Others do"	*Russian*
	(*b*) "Air du Prix"	*Old French*
IV.	"We're a' Noddin"	*Scottish*
V.	Duet. "La petite Lingère"	*Old French*
VI.	"Wiegenlied"	*Swedish*
VII.	(*a*) "Come, Lasses and Lads"	*English*
	(*b*) "Robin Hood"	*English*

With both speeches and music the guests were highly delighted; and they repeatedly marked their approval in a most enthusiastic manner. Immediately after dessert,

The GOVERNOR rose, and gave the toast of "The King," and, following, that of "The Honoured Friend of our King, the Worthy Head of a Great Nation, M. Fallières."

REMINISCENCES—FRIGHT AND PROGRESS.

The GOVERNOR, again rising, remarked that they were not met there that evening to make and to listen to long speeches; but he thought they would be wanting in a sense of the fitness of things if they parted without drinking to at least one more toast—that was, the toast of welcome to the Société Technique du Gaz en France, and to express hearty thanks and appreciation for the presence of the members and their ladies that night. The previous day, his friend Mr. H. E. Jones, in most appropriate language expressed words of welcome on his own behalf and that of himself (the Governor) as old engineers who had had some practice among their friends on the Continent, and as honorary members of the Société Technique du Gaz. But that night the premier Gas Company—premier, he believed in age as it certainly was in the volume of its gas business—in the world were honoured by having the members of the Société as their guests. The Company were delighted to have the opportunity of showing their respect to, and appreciation for, a Society that had done so much for the advancement of the gas industry, not only in France but far beyond its frontiers. At the same time, while the voice was the voice of one Company, the welcome was that of each of the Companies in London, and all those throughout the kingdom who were interested in the industry represented by the Société. Might he be allowed to go back that night to a very memorable evening spent thirty years ago as the guest of the Société in Paris. It was an exhibition year as this one was; and he thought it was the first year in which the streets of Paris were partially illuminated by electricity. He did not think any of those who were present on that occasion would ever forget the kindness that was exhibited to them. To him (Mr. Woodall), it would be an enduring remembrance so long as he lived. It was his fortune to be at the time President of the old British Association of Gas Managers, which was the parent of all gas societies that had since grown up in England. The words of welcome that were spoken to those who were thirty years ago at the banquet on the island in the great lake of the Bois de Boulogne were such as he remembered to this day. At that time, he was not sure that some people in the gas industry, both in France and here, did not think the time of gas banquets was probably nearly over. (Laughter.) Some of them almost shook in their shoes at the thought of the competition that was in front of them at the time. There was a great fall in the value of gas property; and the foundations of many a fortune were then laid by those who had confidence in the gas industry, and retained and extended their investments in it. Thirty years, as he said, had passed; and he thought he might say that no thirty years—no similar period in the history of gas lighting—had witnessed so vast an advance in the industry as that to which he referred. He thought he was within the mark in saying that, during that period, there had been an increase of something like 200 per cent. upon the output of gas and upon the amount of capital invested in the industry, as well as in the profits that had been earned. He was not sure that the competition which commenced at that time had not had something to do with the advancing prosperity to which he alluded. He thought it gave rise to a spirit of investigation and invention that had borne fruit ever since; and most certainly it had the effect of introducing to the poor, not only in England but throughout Europe, the advantages and conveniences of gas at a much earlier date than would otherwise have been the case. He ought to apologize for having lapsed into gas in this way; but some present would sympathize with him, inasmuch as it was so difficult to get out of one's mind that which occupied so large a portion of one's working life. Once more he thanked their guests for their presence, and more especially the ladies for having presented themselves in such welcome numbers. He was sure if his friend Mr. Watson was speaking instead of him, he would say "Will ye nae come back again an' soon?" (Laughter.) He gave them the toast of the Société Technique de l'Industrie du Gaz en France," coupled with the name of M. Coze.

M. COZE, in response, addressing "the ladies, the Governor, Directors, and officials of the Gaslight and Coke Company, and his dear colleagues," said he could not find words with which to express his feelings and the thanks of himself and fellow-members of the Société Technique du Gaz for the generous kindness shown to them by their friends. They had had everything they could desire. They found for their minds, for their eyes, and for their hearts the fullest satisfaction. For their minds, they had that morning seen one of the great stations of the largest Gas Company in the world; their eyes had feasted on the beauties they saw all around them; and their hearts were filled to overflowing by the expressions of kindness that had been exhibited to them as individuals and as members of a neighbouring great nation. Mr. Corbet Woodall had referred to a journey he made across the Channel many years ago, when the Société Technique du Gaz had in Paris their first meeting, which was conducted and gathered force through the impending competition of the electric light. That competition had, indeed, brought about the greatest endeavours on their part as gas engineers and managers to make progress, as Mr. Woodall had so well said. Progress had been made; and a considerable amount of capital had since been invested. It was when one was associated with such a Company as the Gaslight and Coke that one could realize, in the best possible manner, the progress that had been made, and what more could still be done. It was this Company that were the first to develop the idea of high-pressure gas lighting for street purposes. The Gaslight and Coke Company had at its head Mr. Corbet Woodall, who was an eminent man in the profession. He was head of a family of gas engineers; his sons were in the profession; and he (M. Coze) recalled that he had an interview with his brother (Mr. Henry Woodall) some 25 years ago, when the inclined retort was put on the market. They had the horizontal retort, the inclined retort, and now one of Mr. Woodall's sons was associated in the invention of a system of continuous carbonization in vertical retorts. He (M. Coze) spoke quite disinterestedly. He welcomed the appearance of the new retort, because its aim was to develop their possibilities and enhance their business. He asked them to raise their glasses to Mr. Woodall, to the Gaslight and Coke Company, and to the united gas industries of Great Britain and France.

The GOVERNOR remarked that he was there that night, not as an individual, but in a representative capacity as the Governor of the Gaslight and Coke Company. Several of his colleagues were present to assist in bidding welcome to the Company's guests; and he would ask Mr. Burke to respond to the toast.

Mr. ULICK J. BURKE, in reply, said he wished that the duty he had been called upon to discharge had fallen into abler hands than his. He felt somewhat overwhelmed by the technical knowledge with which he was surrounded. He was in the position of a Director who looked after the business side of things, and not one who dealt with the technicalities of gas manufacture and distribution. But they all did their level-best; and they found the combination a very happy one. They were fortunate in their Company in having in Mr. Corbet Woodall a gentleman who had full technical knowledge, and with full powers as a Director, to direct them in the best possible way. With reference to their meeting there that day, they could not help being struck as one saw what had been going on in the gas world now for some time, with the great brotherhood of science. Whatever jealousies there might be in other directions, where gas science was concerned there seemed to be nothing but brotherhood. Many years ago they were in fear of strikes; and the gas labour world was in the greatest possible disturbance. They then went out to see M. Coze, who had an invention that was capable of helping them in their troubles. And they now had the vertical retort. But there was no jealousy. The inventor of the inclined system welcomed the vertical system, because of the progress it offered. British gas engineers had been to Berlin; their guests were going to Bournemouth the next day. Wherever the advances of science in the gas industry were to be seen, there all were welcome. This was a good sign. The present occasion he regarded as another testimony to the oneness of interests in the gas industry.

After further music, "Auld Lang Syne" was sung with crossed hands; and the French visitors did their part in it with vigour and pleasure. The National Anthem followed, and then with one great "Hurrah!" all left the tables—many of the guests to spend a little time in the illuminated grounds of the exhibition.

THE VISIT TO BOURNEMOUTH.

The full programme of the previous day did not deter (we think it may be said) the whole of the gentlemen members of the French party being at Waterloo Station in good time before the 10.15 train left for Bournemouth. It had been considered that the day's excursion would be too fatiguing for the ladies to undertake; and much though the absence of their company was regretted and missed, the arrangement was certainly the right one. It was a glorious morning. "Old Sol" was at his best; and the members of the party were all fresh and fit for the perfect enjoyment of this trip to charming Bournemouth. Travelling on such a day with the sun throwing its full power on the crowded saloon carriage was sufficient to make one feel somewhat uncomfortable; but the beautiful scenery—the refreshing meadows and the green trees, the clean and excellently maintained towns and villages of Surrey and Hampshire through which the railway route to Bournemouth runs—had quite an enchanting effect on the French travellers, and was counteractive of any discomfort by the prevailing temperature.

When Central Bournemouth Station was reached, there was the Chairman of the Bournemouth Gas and Water Company (Mr. G. Crispe Whiteley), one of his colleagues (Mr. Alderman Samuel L. Rymer, J.P.), and the Engineer and General Manager (Mr. H. W. Woodall)—all cordial, genial, and courteous as ever—ready to receive their guests. Mr. R. Hesketh Jones, J.P., who is also a member of the Board, joined the party at the Canford Cliffs Hotel later. It was greatly regretted that Mr. Corbet Woodall, who is also a member of the Board, was unable to be present. But he had devoted himself so zealously and generously to the visitors from the Monday morning to Tuesday night, that all were able to forgive him for anything. Had they known, too, the nature of an engagement in which he was to be involved later in the week, their gratitude to him for having devoted so much time to them would, if it were possible (which we doubt), have been of a still more enthusiastic character. The visitors also quickly made the acquaintance of Mr. A. M. Duckham, the collaborator with Mr. H. W. Woodall in the perfecting of the system of continuous carbonization, and Mr. Duckham's successor in the assistantship at Bournemouth, Mr. P. G. Moon.

Motor-cars were in waiting outside the station, and through Bournemouth and Poole the visitors were soon carried to the Canford Cliffs Hotel, the lovely grounds of which they explored

and enjoyed the splendid sea view to be obtained from them. But there was little time to spare for this pleasure, though very alluring. A fixed programme had been arranged, and the visitors were desirous of carrying it through. Luncheon was served in the large dining hall in which the Southern District Association were the guests of the Bournemouth Company more than twelve months ago. Mr. G. Crispe Whiteley was in the chair; and on his right and left hand sides were M. Coze and M. Godinet, the Mayor of Poole (Mr. W. P. Hunt), the Mayor of Bournemouth (Mr. G. E. Bridge), Mr. Hesketh Jones, Alderman Rymer, and Mr. H. W. Woodall; and other gentlemen associated with the district and Company were also there to honour the visitors. It was a happy and social-loving company that sat round the board; and right well was the luncheon served. After dessert, there were a few toasts.

The CHAIRMAN (speaking in French) first proposed "The King." He expressed the hope that His Majesty might long reign over a happy and contented people, and that God would preserve for many years a life which was consecrated to the laudable effort of welding together the nations of the earth in unity, peace, and concord.

The toast having been honoured with enthusiasm,

The CHAIRMAN (again speaking in French) asked the company to "empty their glasses" to the health of the President of the French Republic—the elected head of a great and free people, with whom we are closely allied. He expressed the fervent hope that M. Fallières might protect Liberty, preserve Equality, and encourage Fraternity.

This toast was also greeted with enthusiasm.

The CHAIRMAN (once more speaking in French) offered the visitors a cordial welcome with the words: "*Soyez les bienvenus!*" He said the Company were delighted to have the pleasure of receiving them at Bournemouth, and hoped their visit to the town—very short though it necessarily was—would leave with them pleasant recollections. Proceeding, he said his friends would allow him to revert to his own language; and perhaps they would understand him a great deal better than they had already done. He could assure all their visitors, from the bottom of his heart, that it was with the greatest pleasure the Company received them that day at Bournemouth; and they would do their best to make the visit a happy and agreeable one. He had a desire to say a few words *apropos* of the occasion. He could assure all present that the Company wished that this visit should be a memorable one. He was not going to deal with the question of the Company's Poole works, which he would leave to his friend Mr. Harold Woodall, who would be pleased to show their visitors everything in which they might be interested. It was sufficient for him (the Chairman) to say that he could not imagine a more important or more helpful way of strengthening the alliance which they desired to have between France and England than such visits as the present one. Fortunately, the realms of science knew none of the limits and boundaries of principalities and powers; and one touch of Science, like one touch of Nature, made the whole world kin. He was old enough to remember the old ties between France and England, and the charming days that used to be spent in France when the Britisher was always welcomed with the right hand of love. They all rejoiced then. Those days had come again; and the two nations were once more united as closely as they were then—nay, even, he hoped, more closely. They had fought each other on the plains of Quebec; on the hills of Crimea they fought the common foe side by side—they and their then foe were now joined together in bonds of mutual amity. The only contest there would be between them in the future would be as to which could wrest the best and the wisest secrets from Nature for the common happiness and welfare of mankind. He raised his glass to the "Success of the Société Technique du Gaz," with the hope that it would increase in vigour and strength for the benefit of the members, and for the benefit of the industry of which they formed a part. He would ask the President of the Société to respond.

M. COZE (speaking in French), in acknowledgment, said the programme of the visit to England was becoming shorter; and, with its completion, he would no longer be President. They had had so much kindness showered upon them during this visit, that, though in his mind he had prepared many speeches, he now found his bank quite empty. Indeed, he found it difficult to discover words sufficient to acknowledge the generous reception that met them everywhere. He, however, thanked their Chairman and Mr. Corbet Woodall, whose absence they all so much regretted. But they could hardly expect his presence after all the trouble he had taken the previous day and the day before. Mr. Hesketh Jones and Mr. Alderman Rymer they also desired to thank. Particularly must they thank Mr. Harold Woodall for this pleasant visit to charming and splendid Bournemouth, which almost made them all wish to stay in England. Mr. Harold Woodall was the son of his father; and when he said that, he meant and felt much. The son was going to follow in the footsteps of his father. Of that they all felt assured. He drank to his health, and to the success of the Bournemouth Gas and Water Company. Good relations there had always been between the gas engineers of the two nations since the beginning of the gas industry. He drank also to the success of the two countries united upon the grounds of Science, to the Mayors of Bournemouth and Poole, and to the prosperity of Great Britain. (The animated speech was greatly applauded.)

Mr. HAROLD WOODALL, in reply, said he thanked the President of the Société Technique very much for the pleasant words he had used with regard to the Bournemouth Company, his country, his father, and himself. The Chairman of the Company had spoken so heartily and so cordially that they would require from him (Mr. Woodall) but very few words. He assured M. Coze that they appreciated very highly the honour of entertaining his distinguished Society that day. He thanked them also for the compliment they had paid the Company in wishing to see their works at Poole, and the process of continuous carbonization, with which Mr. Duckham's and his own name were associated. He was afraid their visitors would not find a large amount to see at the Poole works; but he could assure them that, whenever they came to Bournemouth, either collectively as a Society or individually as members of the gas profession, they would always find one thing, and that was the heartiest and most cordial of welcomes.

Mr. R. HESKETH JONES, well known to the visitors, was received by acclamation. Speaking in French, he said it was the third time he had had the pleasure of meeting his friends the members of the Société Technique de l'Industrie du Gaz en France—first at Brighton, eight years ago, next at Havre three years since, and now at Bournemouth. This justified him in calling the members of the Society his "friends." The Mayors of Poole and Bournemouth had been good enough to honour the gathering with their presence; and he would therefore ask the company to join with him in drinking to the health of these two gentlemen, and to the prosperity of the towns they so worthily represented.

The MAYOR OF POOLE, acknowledging the toast, said, on behalf of the borough of Poole, he deemed it a great honour that the borough was entertaining such a distinguished company that day. He was glad there were in the borough works of such importance that visitors from France were desirous of seeing them. He hoped the visit would be a profitable one. Great advantage he believed was obtained from intercourse such as this. Their Chairman had used some well-selected words when he said that no boundaries were recognized by science. Science made them one in common; and the interests of mankind should also be their one common object. If they lived to serve humanity, their lives would not have been spent in vain.

The MAYOR OF BOURNEMOUTH also replied. He observed that there was nothing in the interests of concord and progress like the interchange of courtesy and good feeling between the representatives of nations; and they indeed felt highly honoured that the Société du Gaz had honoured the borough of Bournemouth and that of Poole by coming there that day. They were all proud of Bournemouth and its lovely surroundings.

Within a few minutes, the party were once more aboard the motor-cars, and were speeding their way along beautiful roads and then through the old town of Poole. It was noticed with satisfaction that the French and British flags were floating together over public buildings and the gas offices. The thoroughfare approaching the main entrance to the gas-works, and in which the employees of the works have their homes, was bedecked, and the pavements were lined with the wives and children of the men. The heartiness of their simple greeting was very highly appreciated by the French gas engineers, who responded to it with the most good-natured vigour. Around the entrance to the works many of the men were assembled, and gave three lusty cheers as the visitors entered the gates.

CONTINUOUS CARBONIZATION IN VERTICAL RETORTS.

The Poole works have been fully described to our readers, and photographic illustrations have appeared (see "JOURNAL," June 4, 1907, pp. 653-7). Several of the visitors made a survey of what all engineers who have seen these works, as planned and carried out by Mr. Harold Woodall, acknowledge contain many original features; and original features that have for their dual object economy and convenience. It would, after accompanying them on Wednesday, be wrong to say that the one and only thing for which the members of the Société Technique went to Bournemouth was to see the process of continuous carbonization in vertical retorts. But it possessed central interest. The installation at the Bourne Valley works was not visited, excepting in the morning by two or three friends who had been staying in Bournemouth overnight. That installation was described in earlier pages of the "JOURNAL" already referred to. Since then, from the working of this and other installations, results have been published from time to time; and particularly in the paper that Mr. Harold Woodall read before the Institution the other week. On the Poole works, however, there is a working retort, embodying the latest conceptions of the inventors for improving not so much the working from the make-point of view, as to overcome those initial difficulties that met the inventors in amalgamating mechanical feeding and discharging, and producing a completely continuous carbonizing process. In the carburetted water-gas plant house, there were suspended large drawings of the new form of retort; and near by were exposed the portions of coke-extractor and hopper, and the cylindrical bottom hopper that constitute the new extracting and discharging arrangement, together with one of the feed-rolls for charging the retorts.

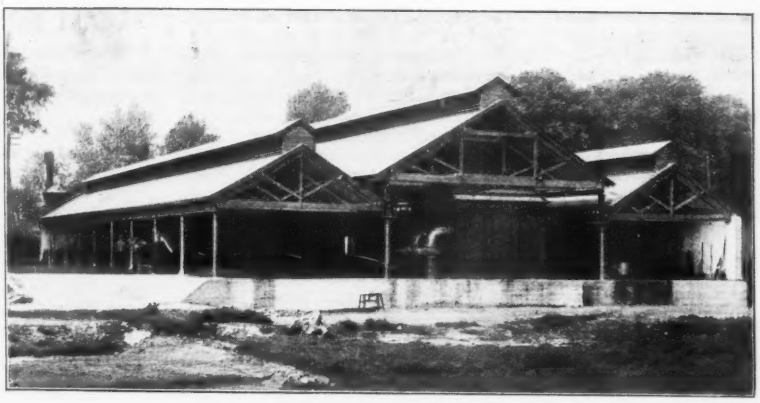
The visitors were exceedingly interested in these parts of the mechanical arrangements; but having exhausted curiosity, they went to the rear of the building, where before them they saw the monumental single retort from which great things are expected. The retort is heated by an independent producer; and therefore the retort stands a strikingly tall object in its brickwork casing. Imagine an encased retort 25 feet high, raised off the ground a sufficient height to allow of the discharging arrangements being well off the ground, so as to permit of a coke truck being run underneath; while at the top of the retort there is the charging machinery—the top and sides being merely protected by means of galvanized iron sheeting. What is thus mentally sketched is what the visitors saw. The top is reached by a wooden stairway, which, for the occasion, had been painted red, white, and blue. Mr. Woodall and Mr. Duckham were both there to give any desired explanation; but they allowed their visitors to go up to the charging-floor and examine freely the methods there, and again the arrangements at the bottom of the retort, and obtaining from either themselves or the attendants whatever information was required by these intelligent inspectors.

Those who had seen the system before were emphatic in their belief that the inventors had done the correct thing in clearing right away the old coke-removing arrangements at the bottom; and in the new arrangement they have faith that success has been attained, that the ultimate proof of continuous carbonization

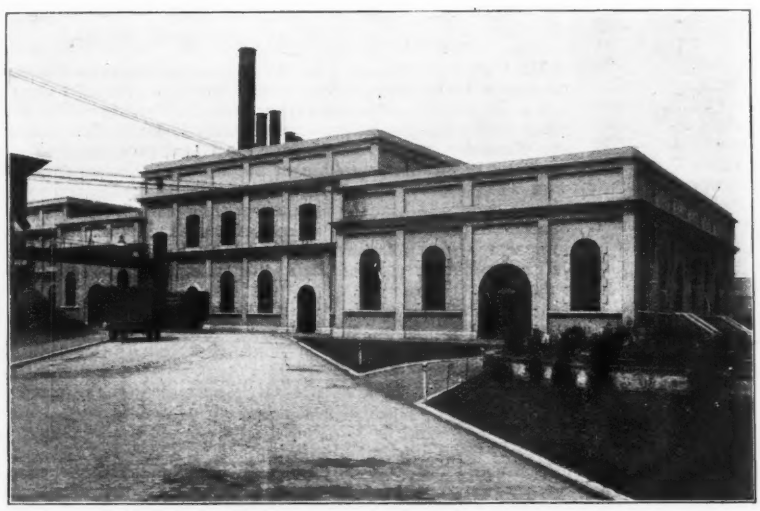
being a practicable process in gas-works is not so remote as was at one time thought, and that those who in times past regarded the joint workers as an amiable pair of visionaries in this matter have now some cause to regret their prejudgment. The visitors heard all about how the ingenious, simple, strong, and easy-working bottom extractor, which makes 1·9 revolutions an hour, extracts about 180 lbs. of coke in that time; and how a corresponding amount of coal is automatically passed in by the mechanically operated feed-roller at the top of the retort as the charge in it sinks. It was heard, too, that the time occupied by the charge in passing from the top of the retort to the bottom was 6½ hours; and in this time 13 cwt. of coal has taken the journey through. Therefore, at the present rate of working, in 24 hours 2 tons 10 cwt. pass through a retort. The extractor has been, in trials, speeded up so that 3 tons 5 cwt. of coal pass through in 24 hours; but the make has not been quite so good per ton as it is at the slower speed. What struck the visitors was that charging, gas making, and coke extraction were going on simultaneously without noise, smoke, or dirt; the while the two attendants—one at the top and the other at the bottom—were explaining, with an enthusiasm that one might expect from personal possession of some good thing, their experiences with the setting. The vision arose of a large installation of these retorts, with one man on the top doing nothing more than a kind of sentry duty—to lubricate where necessary and to see that there was no stoppage in the feed of the coal—and another man at the bottom performing practically the same duty there, excepting that he would see there was no hitch in the discharging of the hoppers, instead of looking after the feeding of the retorts. About the extractor, in this trial retort little power is required to drive it, seeing that it makes only 1½ to 2 revolutions per hour. A small electric motor is used for the purpose. At the moment, the cylindrical hopper at the bottom (with a capacity of 170 lbs.) is discharged by hand; but it is to be driven mechanically. Another change that is being effected in future installations is that the cross section of the extractor chamber is to be made, instead of with square sides (other than on the inclined side), of the same cross section as the retort.

There is yet another point that was noticeable. Few inquiries were made by the visitors as to the illuminating power of the gas; and, in fact, it is a matter of difficulty for them to appreciate why there should be so much fuss about illuminating power? It was remarked that a mixture of somewhat poor coals was being used at the time of the visit; but Mr. Woodall was able to report that the results given in his Institution paper (see "JOURNAL," June 23, p. 806) fairly represented the results of the present working. This is very satisfactory, when it is remembered that the average make per ton given in that table over ten days' working was 14,165 cubic feet of 14·26-candle power (Carpenter burner test), and of a calorific power of 551 B.Th.U. The results for the day of the visit were:

Coal carbonized	50½ cwt.
Gas made	35,300 cub. ft.
Make per ton	13,980 ,,
Illuminating power	15·0 candles.
B.Th.U. gross	578
Coke made (dry)	35¾ cwt.



Purifier House and Station Meter.

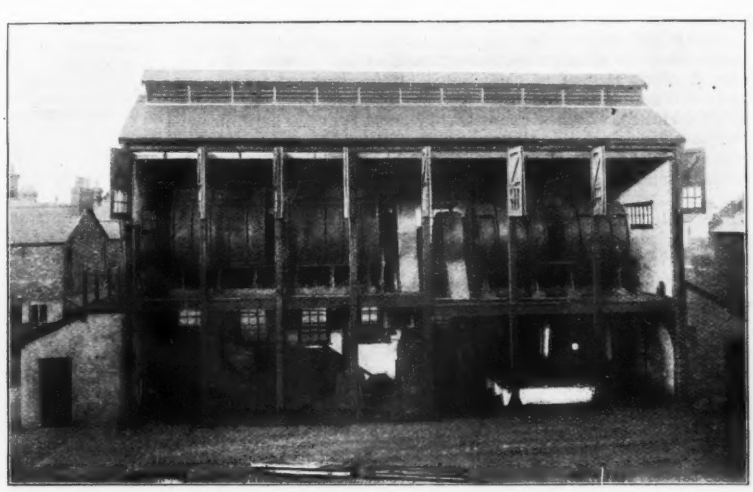


Water-Gas Plant, Power House, and Boiler House.

Another matter observed is that the coke is quenched before it leaves the hopper by the passing of water into the latter by a small pipe; and, quenched in this way, it is found that only about one-eighth of the water commonly used for quenching is needed. Naturally the question arises, What becomes of the steam generated? The reply is that it must be mostly absorbed in the bottom part of the retort, as analyses do not show any noticeable increase of carbon monoxide in the gas, such as would be the case if a material proportion of steam found its way up into the retort.

A point was raised at the Institution meeting that the descending movement of the charge in the retort must have some bad effect on the coke, and that the extractor must also have some grinding effect. A mixture of poor coal, it has been said, was being used at the time of the visit; the coke was seen and examined as it dropped from the bottom hoppers. Fears are ill-founded. The coke is in large pieces; and the breeze made is surprisingly scarce. The coke is also particularly silvery bright, and of a much more pleasing appearance than that made from similar coal in horizontal retorts.

So enamoured were the visitors of the demonstration of the system of continuous carbonization, that they left little time for an inspection of the remainder of the works. They saw the coal transporter; and the gravity bucket conveyor for the delivery of coal into the retort-house. They looked into the retort-house and saw the De Brouwer projector and the De Brouwer-Jenkins ram. They were interested in the coke-handling plant, the Humphreys and Glasgow's carburetted water-gas plant, the gas-driven electricity plant, the elevation and enclosure of the washer-scrubbers, and the ploughing of the oxide of iron for revivification purposes



The Range of Scrubbers.

(ploughing of the oxide is, our representative at Berlin told us last week, also practised at the Tegel works of the Municipality).

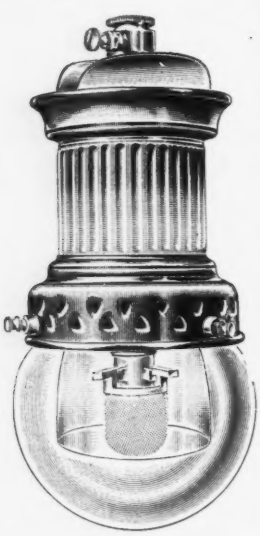
But while indulging themselves in the interesting features of the works, time necessitated that the visitors should be brought together again, in order that they might enjoy before leaving for London a cup of tea, fruit, and other light refreshments in a marquee erected near the retort-house. A few minutes later, M. Coze summoned his fellow-members round him, and called for a vote of thanks to Mr. G. Crispe Whiteley, his colleagues, and Mr. Harold Woodall; and he said he hoped that they would soon have the pleasure of returning from France, in some measure, the hospitality received on the present occasion. Hearty cheers were raised. Mr. Whiteley, in acknowledgment, said it had given him and his colleagues the greatest pleasure to receive such appreciative visitors from France. Hospitality was, like Charity and Mercy, always twice blessed; both caused pleasure to those who gave and those who received. A photograph of the party was then taken; and shortly afterwards hosts and guests were bidding each other adieu on the platform of Poole Railway Station.

Au Revoir.

At Waterloo, we parted from our cheerful and welcomed visitors, most of whom the same evening or the following morning left London to return to their respective homes. A few remained behind for another day in London, but departed in the evening.

A CHEAP INVERTED BURNER.

A very long time has elapsed since a certain renowned Poet made a perhaps equally well-known character in one of his plays ask "What's in a name?" and follow it up with an argument intended to show that there was little or nothing at all. It would be a very venturesome person who would say how many million times the quotation has since been used; but in spite of this popularity, it is evident that if the lines were true in the Sixteenth Century, there has, at any rate in the commercial world, been a great change since then. Nowadays the manufacturers of proprietary articles would unanimously agree that, so far from the name being unimportant, it is a matter calling for—and usually obtaining—most careful consideration. Hence we are faced at every turn with goods on which more or less appropriate names have been bestowed. It must be admitted that, as a general rule, these distinguishing words are well chosen; and this brings us to the object of the present article, which is not to discuss the application of our greatest playwright's argument to present-day conditions, but to perform the—to readers of the "Journal" at least—equally interesting and more useful task of drawing attention to a new inverted gas-burner. This is the latest introduction of Messrs. J. & W. B. Smith, of Farringdon Road; and it was the catchy name given to it—the "Cap-it-al" inverted gas-burner—that gave rise to the thought just expressed.



The lamp is of the Graetzin type; and it has been designed primarily with the object of providing a reliable inverted lamp of this kind, at a very low price, suitable for attaching to the gas-fittings in private houses, &c. The shape and size of the lamp certainly admit of its use on brackets and pendants without any sacrifice in the matter of appearance; while its lighting capacity is claimed to be about 100-candle power with a consumption of some 3½ cubic feet of gas per hour. It is arranged to take a standard mantle; and the casing is enamelled in white or green (with gold lines), which will not tarnish, and is easily kept clean. There is no inside flue to the casing, but merely two wings at the top (as shown in the illustration), which direct the products of combustion away, so that they do not mix with the primary air supply. There are a gas-adjuster and air-sleeve, in order that the best possible results may be secured under any pressure; and the lamps can be had fitted with a bye-pass or not as desired. The price at which this light is being put upon the market, apart altogether from its other features, should ensure its popularity.

At the recent conference of the Association of Rural District Councils, Mr. J. S. Killick, of Croydon, contributed a paper on the tar treatment of road surfaces. He said that the use of tar did not deal effectually with the question of dust, but it was a partial remedy. There were two kinds of dust—one due to attrition, which tar prevented; and the other caused by deposit, which it did not prevent. In places where the roads had to be repaired more than once in three years, he thought it was beneficial to tar them. In cases where they had not to be repaired more than once in three years, tarring was not an economical process.

ALKALI WORKS CHIEF INSPECTOR'S REPORT.

The Forty-Fourth Annual Report of the Chief Inspector under the Alkali Works Regulation Act, 1906, was issued yesterday. It contains an interesting record by Mr. R. Forbes Carpenter, the present Chief Inspector, of his own work and that of the several District Inspectors during the year 1907. The former is dealt with in the following article; and the latter will be noticed, as usual, in subsequent issues.

The number of works registered in England, Ireland, and Wales under the Acts on Dec. 31 was 1231. Of these, 72 only were works decomposing salt with evolution of muriatic acid, and so scheduled as alkali works; while the remainder (1159) carried on processes which were scheduled or were subject to registration under the Act of 1906. These numbers show an increase of 153 scheduled and registered works, as compared with 1906. There are also 158 works registered in Scotland, which, as usual, are dealt with in a separate report—bringing the total number of works registered in the United Kingdom to 1389. The number of separate scheduled and registered processes under inspection last year was 1821, compared with 1470 in 1906. The increase is attributed to the changes introduced by the operation of the Act of 1906, both in the number of registrable works and of registrable processes in works already under the purview of the Acts of 1881 and 1892, now repealed. The Inspectors paid 4269 visits to works, and carried out 5266 tests, compared with 5160 visits and 5515 tests in 1906. It is gratifying to find that no proceedings were actually taken against the owners of registered works in 1907; but at the close of the year the question was under consideration in four cases.

Sulphate of Ammonia and Other Works.

Mr. Carpenter reports that the number of works in this class continues to increase, having risen from 536 in 1906 to 554 in 1907. No notable alteration in the method of dealing with the foul gases evolved during manufacture stands to be recorded during the year, though the extension of the Claus process of sulphur recovery to another sulphate of ammonia works in connection with a large coke-oven plant might be mentioned, since to this class of work the Claus process is specially suited, looking to the continuous character of the operations conducted. With the increasing use of coke-oven gas in gas-engines (since the surplus of gas over that required for oven heating is, with regenerative ovens, often 50 per cent. of that made on the coking process), the need of purification of the gas from sulphur impurities will be increasingly felt. The method, therefore, of re-scrubbing the gases from the sulphate of ammonia plant, together with the crude gas from the ovens, will, Mr. Carpenter says, no longer present the attraction that it does at present. Consequently, the separate disposal of the saturator gases by such a method as the Claus process is likely to receive more attention from manufacturers. Those who are interested in the subject of the varied means employed for the disposal of these gases will find full details in the reports of the District Inspectors, to be dealt with later. In regard to the subject of the means taken to reduce the amount of volatile cyanogen compounds in the liquors before distillation, experimental work proceeded in various quarters during the year in both gas and coke-oven works.

Recovery and Production of Ammonia.

Mr. Carpenter gives his customary statistics (for which he acknowledges his indebtedness to manufacturers) in regard to the production of sulphate of ammonia in the United Kingdom. The figures—which, he remarks, again present features of considerable interest—are as follows:—

—	1907.	1906.	1905.
Gas-works	165,474	157,160	155,957
Iron-works	21,024	21,284	20,376
Shale-works	51,338	48,534	46,344
Coke-oven works	53,572	43,677	30,732
Producer gas and carbonizing works (bone and coal)	21,873	18,736	15,705
Total	313,281	289,391	269,114

It will be seen from the foregoing figures, that the most important contributor still remains the gas industry. The increase in ammonia production last year was more substantial than at any previous period in this century. In 1900, the amount contributed from gas-works was 142,419 tons. From 1903 to the present year, the amounts have been as follows:—

	Sulphate of Ammonia. Tons.	Increase over Year Preceding. Tons.
1903	149,489	.. − 566
1904	150,208	.. + 719
1905	155,957	.. 5749
1906	157,160	.. 1203
1907	165,474	.. 8314

The increase in 1907 was distributed fairly evenly. The gas-works in the eastern and south-eastern counties for the first time for several years past showed an increase. From 1903 to 1906

inclusive the amount in this district was practically constant, showing not only no increase, but a slight decrease from 1903.

As regards the statistics of coal carbonized in gas-works, various estimates have been made. The Board of Trade publish annually returns of coal carbonized in the works of statutory gas companies and of gas undertakings belonging to local authorities; but Mr. Carpenter points out that these are by no means exhaustive, since no account is taken of works in private ownership or belonging to limited liability companies. According to the best estimate he has been able to obtain, certainly 15 per cent. should be added to the Board of Trade figures for companies. As these data when last presented (for the companies to Dec. 31, 1905, and for local authorities to March 25, 1906) were 14,480,325 tons, it would seem probable that 15¾ million tons of coal were carbonized last year in gas-works. The figures given by various witnesses before the Royal Commission of 1904 on the Probable Duration of the Coal Supplies are fairly in accord with these figures, allowing for increases of coal-gas production in the interval.

Iron-works recovering ammonia from blast-furnace gases are almost entirely confined to Scotland, as only in special districts is coal possessed of sufficient hardness to stand in the blast-furnace without crushing. The English works are confined to Staffordshire. There was again a substantial increase from shale-works; showing the great excellence in working of the modern large shale retort, variants of which are now in operation at all of the Scotch oil-works, to which industry this important contributor (one-sixth of the production of the United Kingdom) owes its existence.

Considerable increase is shown with respect to the coke-oven works; and Mr. Carpenter gives an interesting sketch of the development of the industry in this country since 1881, the date of the erection of the first recovery ovens (the Simon-Carvès) by Messrs. Pease Partners, at Crooke, in Durham. In 1876, the late Dr. Angus Smith (the Chief Inspector) estimated that 15 million tons of coal were made into coke. Taking an average yield of 20 lbs. of sulphate of ammonia per ton, he arrived at a possible recovery figure of 130,000 tons of this salt per annum, which would yield its manurial value to 1,300,000 acres, for increase of crop; moreover, a material increase in national wealth would be added by the tar also recovered. The date of the erection of the first Semet-Solvay recovery ovens was 1886; the second installation, at Brymbo, North Wales, following in 1894. In 1895 there were eight works in the country recovering bye-products; one of these being a modification of the beehive oven securing recovery of about 40 per cent. of the possible ammonia. The total ammonia recovered (as sulphate) at these works in that year did not reach 2100 tons. In 1900, it was 10,393 tons; and last year 53,572 tons. In 1897-8, the first Otto-Hilgenstock ovens were erected; and they were followed by others of modern type at a few years' interval. Mr. Carpenter gives a table which shows the annual rate of progress in the production of sulphate of ammonia from recovery ovens since 1895, and says the figures are very encouraging, and indicate that still more may be expected for some years to come, there being several large plants in course of construction.

The continued increase in producer gas plants with recovery of ammonia is also regarded by the Chief Inspector as a matter for satisfaction. Rapid extension of such plants has taken place both in England and Scotland during the past four years; the production of ammonia from this source having risen in Scotland more than fivefold in this period. Since 1898, the production in the United Kingdom has risen tenfold. From the evidence given before the Royal Commission of 1904, it still appears to be held by most experts that recovery will not pay for less than 50 tons of coal carbonized per day. On the other hand, during the last few years ammonia recovery has been adapted by an eminent firm of gas-engine makers to small producers gasifying bituminous coal for gas-engine use. In these plants there are some substantial modifications of the Mond design; but Mr. Carpenter says it is too soon to speak with confidence as to their success in the hands of an ordinary unskilled workman, to whom the generation of the gas is usually entrusted.

Some difficulties have been experienced with river authorities having jurisdiction in the districts where some of these works are situated; apprehension being felt as to the presence of sulphocyanides and phenoloid bodies in the refuse water discharged from the works. Some typical samples examined appeared to indicate that, as regards cyanogen compounds, there was absolutely no cause for apprehension; the reactions in the Mond producer taking place at very low heats. Mr. Carpenter points out that a good deal of objection on the score of tarry bodies can be removed by careful and systematic filtration of the effluent before discharge from the works. Concerning the general treatment of effluents arising from distillation of ammoniacal liquors, further remarks will be found on pp. 48 to 53 of the report.

During the past two-and-a-half years, experimental work has been proceeding at the works of Chemicals Limited, at Carnlough (Antrim), for the recovery of ammonia as sulphate and other residual products from the distillation of peat. Mr. Carpenter says it would appear that this stage of experiment is now past, as a trial run on the form of producer last adopted—a run on a substantial scale over several weeks—has been so satisfactory that, the size of unit being now settled, it only remains to multiply this into a bench to secure full operations for the factory. The process, known as the Woltereck, secures the recovery of the paraffin tars (yielding some substantial amount of solid paraffin on cooling), acetic acid, and ammonia. From 500 to 600 tons of moist peat, representing 200 tons of dry peat, were used in the trial run; the minimum yield of ammonia (five tons of sulphate for every 100 tons of dry peat) being deemed a quite satisfactory proportion of the nitrogen content of the original material. It is expected that before the end of the current year the works will be in full operation, with an output of sulphate of ammonia at the rate of 5000 tons per annum; being about double that of the present produce from gas-works throughout Ireland.

Bacterial Treatment of Spent Liquors.

The next section of the report is devoted to the above subject. In the two preceding annual reports, the Chief Inspector directed attention to the increasing stringency that has characterized the regulations made by the local sanitary authorities in regard to the reception of spent ammoniacal liquors into the sewers where bacterial treatment of sewage is applied as a purifying method. Perhaps in no other place does the problem present itself in so acute a form as at Oldbury, lying as this does in the heart of the busy industrial district of which Birmingham is the most populous portion; a large part of the gas liquor produced in Birmingham and the district being treated outside the drainage area. The Oldbury District Council entrusted to Professor Percy Frankland the study of ascertaining "the best practicable means" of meeting the difficulties they encountered; and he, in February, 1907, contributed the results of the prolonged inquiries by himself and Mr. H. Silvester to the Birmingham and Midland Section of the Society of Chemical Industry.* The authors show that sulphocyanide is not destroyed in the septic tank, and that the "oxygen absorbed" is apparently not reduced there either. In connection with the extraordinary oxidizing powers displayed by the bacteria beds, the authors made experiments to determine the amount of oxygen required for the oxidation of the chief ingredients of spent gas liquors. These were made exactly upon the same lines as in estimating the oxygen absorbed in four hours at 80° Fahr. in ordinary sewage analysis. The authors found by experiment that sulphocyanide appears to undergo no change in an effluent containing an abundance of nitric nitrogen, even in the course of four days, at about 20° C.

Mr. Carpenter also refers to the further contribution to the data needful for reaching a practical solution of these problems presented to the Manchester Section of the Society of Chemical Industry last December by Dr. F. W. Skirrow, "On the Determination of Phenols in Gas Liquors." † In the last two annual reports, reference was made to the experiments conducted by Dr. Gilbert Fowler in Manchester "in the direction of reducing the oxygen-consuming power of the effluent by very simple means." Some results, obtained by Dr. Fowler and Mr. Carpenter's Assistant (Mr. S. E. Linder, B.Sc.), and communicated by the former, are given. They show that after splitting up the sulphocyanide, oxidation is carried to sulphates and nitrates; the percentage of oxygen-absorbed reduction "running regularly in the 90 per cents." No clogging took place in the filter. Mr. Carpenter says these *résumés* of study of bacterial activity exercised on such chemical compounds as are met with in the effluents of residuals works are presented, since it may be anticipated that modifications of, and additions to, plant will follow in districts where difficulties such as those indicated are experienced by manufacturers in meeting the requirements of Rivers Boards. The record forms a contribution to the literature of the subject of "Bacteria in the Service of Man."

Constitution of Ammoniacal Liquors.

Some samples of ammoniacal liquors from various sources were examined in the Chief Inspector's laboratory last year; but no complete analysis was made as in former years, as the points raised in connection with which the samples were obtained were various, and during the whole year there was so much pressure in connection with the commencement of the administration of the Act of 1906, necessitating the undertaking of analyses of very varied nature, that time was not available for prolonged or continuous research. The report contains, however, the results of the examination of liquors from the setting of eight retorts, inclined at an angle of 45°, at the Guildford Gas-Works, in comparison with those from the horizontal retorts of exactly the same length and sectional area in works carbonizing the same coal, and of samples concurrently procured of liquors from the Poole works of the Bournemouth Gas and Water Company, where the Woodall-Duckham vertical retort of the most modern type and setting is in operation, and its residual products can be separately sampled, and the results of analysis set side by side with those from liquors from the stock wells of the horizontal settings. There are also tabulated results obtained with the vertical retorts of the earlier type at the Bourne Valley works. These results were obtained just as Mr. Carpenter's report was being closed, so that the discussion of questions they suggest is reserved, since more experience needs to be accumulated by examination of future samples of liquor.

The interesting tables above referred to we are compelled to hold over till next week, when the remainder of the report will be dealt with. This includes some remarks on Feld's washer for the removal of tar and dust from gases, which is illustrated; a section entitled "Studies in Coal Carbonizing;" and the Chief Inspector's report on sulphide works.

* See "Journal," Vol. XCVIII., p. 92. † *Ibid.*, Vol. CI., p. 357.

ROUND THE WORLD—AND SOME GAS WORKS.

By Maurice Graham.

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IV.—CALCUTTA.

The City of Calcutta, the capital of the Indian Empire, has a population of nearly one million, while that of the area supplied by the Oriental Gas Company is 1,250,000. Calcutta is a thriving manufacturing centre, with over 250 large mills, one of the chief industries being engineering. The town is splendidly arranged, with a large open park, called the Maidan, which is two miles long and three quarters of a mile wide, reminding one of Hyde Park. It is lighted by incandescent gas-lamps. On one side of it is the River Hooghly (jokingly called the "Ugly"), and on the other the famous Chowringhee Road, or chief shopping centre. Calcutta has all the equipments of a modern city, from electric trams to refuse destructors. Its shipping and commerce are enormous. Its public lighting is all done on the incandescent gas system; there also being high-power lamps of all kinds. One of these is shown in Photograph No. 34. The lighting is effectively arranged, affording brilliant displays in many of the important positions in the town. There are only nine electric lamps, which are flame arcs, put up merely as an experiment. Electric light has been kept out by the skilful diplomacy of the Gas Manager, and by the intensity of the gas lighting—the latter being also, of course, much cheaper.

Photograph No. 34.—One of the High-Pressure Gas-Lamps.

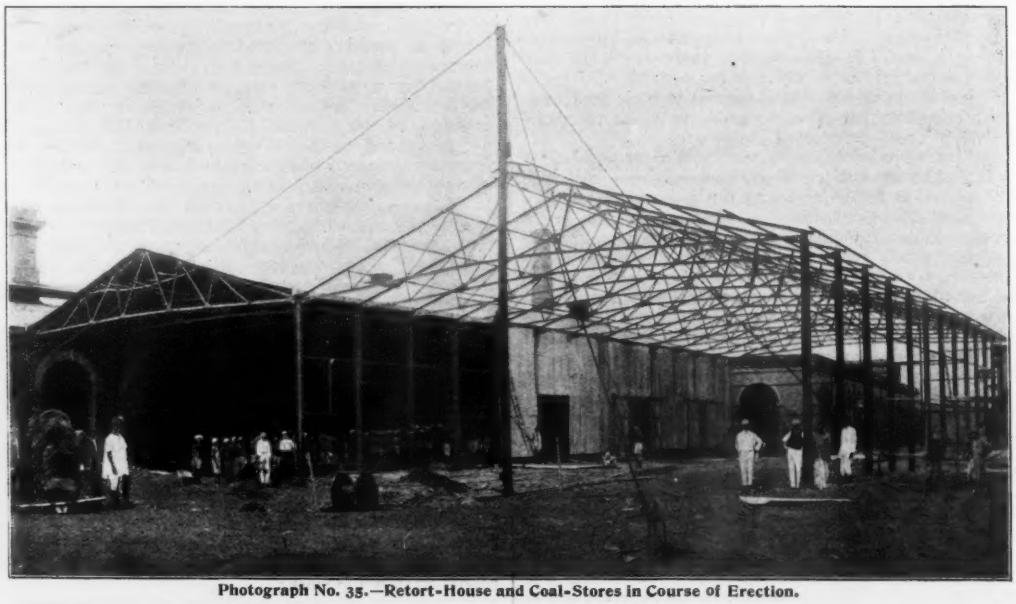
The Gas-Works.—Retort-Houses.

Calcutta is lighted by the Oriental Gas Company, Limited. The Chairman is Mr. R. Hesketh Jones; and the Engineer and Manager is Mr. James C. Watson, who gave the writer a splendid welcome and showed him round the works. He has an able assistant in Mr. L. G. Barber, late of Salford and Colombo, who has had a few years' Indian experience, and is therefore of considerable value to the Company. The Oriental Gas Company was founded in the year 1853. There are two works, Sealdah and Howrah. The latter will be briefly referred to later on.

The retort-houses, which, with the coal-stores, are shown in Photograph No. 35 in course of erection, are built of steel structure and are of substantial character and design. Every care has been taken with regard to ventilation; and they are well lighted with Lucas lights. The system of furnace adopted is that of shallow regenerators; the results seen being highly satisfactory. There are a few direct-fired settings still working; but these are being dispensed with as speedily as possible, so as to effect a great saving in the use of coke, which is such a valuable commodity and commands a very high price in Calcutta. Some of the fire-bricks used are made in India to Mr. Watson's instructions; for when all came from England, there was much trouble owing to breakages in delivery. Mr. Watson also makes special fire-clay blocks in the gas-works; and he finds that these blocks, made from ground-up old material, have little or no contraction or expansion, and give the utmost satisfaction. The retort-houses are kept in a clean and methodical way. Machinery is not seen in them, nor for conveying coal or coke. The reason is not far to seek. Any trouble with the men who would work it would place the Engineer in an awkward position in a country where "caste," or trade-union principles worked on religious lines, predominates. Mr. Watson knows his man, and refuses to overwork or overload him; but he demands the maximum quantity that can be done by this type of physique. Some idea of this, and of No. 1 of the two retort-houses, can be got from Photograph No. 36.

Coal and Coke.

Coal is brought into the house by hand, and coke is taken out in the same way. Large and well-built steel waggons, 22½ tons gross, are used for carrying all coal from the colliery to the gas-works. A remark uttered by Mr. Watson was to the effect that he wished at the present time [January, 1908] that the trucks were "twice the size," owing to the small stock of coal and the troubles lately experienced in the getting of it. He has only just gone through two severe strikes on two railways; so that his anxiety can be imagined—especially after seeing the coal stores nearly empty, with only two or three days' supply. But his cheerfulness under these trying times is simply astounding; and one could pick him out as one of the best men to cope with the difficulties of a strike, while looking on at it with a smiling face, which covers the determination to succeed. A railway track is laid throughout the works, so that easy facilities for loading coke and unloading general goods are afforded. But the Calcutta coke conveyors are human ones, as seen in Photograph No. 37. The coke is large, lumpy, and of crystal appearance. It is all sorted



Photograph No. 35.—Retort-House and Coal-Stores in Course of Erection.

Photograph No. 36.—Inside No. 1 Retort-House.

and hand-sieved for the trade, while the breeze is used for firing the boilers. The coke is carried into the town by bullock carts (see Photograph No. 38).

Other Plant.

The boilers, which are fitted with Wilton's furnaces and give every satisfaction, are divided into two groups, as the Engineer prefers to distribute his source of power so that in the event of any breakdown he feels safe. Condensation of steam is thus also reduced. The gas is cooled by cast-iron pipes in a large concrete tank above ground full of flowing water; and there are two of Pelouze and Audouin's tar-extractors placed before the exhausters. The engine and exhauster houses are very nicely kept. They contain five Beale exhausters. An additional exhauster house, in course of construction, will be a great acquisition to the works. The same regard for the engine-room is evidenced here as at home; and boots must be taken off by the natives before entering. Next to the exhauster house are five of Walker's tower-scrubbers and a Holmes rotary washer. When asked what was in the scrubbers—coke or boards, Mr. Watson, with a twinkle, replied "packing cases;" for all the cases received are cut up for this purpose.

All this heavy class of apparatus is here put under cover, to protect it from the sun's rays. These rays are not like those from an English summer's sun, but are just as they would be under a magnifying glass. Verandahs, quite Eastern in appearance, are arranged round the buildings, to protect the workers from the intense heat. A little thought, therefore, when designing results in considerable comfort to the workpeople without unduly increasing the expense. The general appearance of these houses is neat and uniform; and they show the supervising hand everywhere. All pipes are kept above ground; so that any mishap can be readily detected. This is necessary where natives are employed.

Purifiers and Special Grid.

The purifier-house was next visited, and much of interest was seen. The purifiers were having the division plates taken out—making each pair into one large box. The lutes were being filled up with concrete; and a curved top was being arranged for the reception of the rubber for luting. Mr. Watson claimed that he would be able at any time to run a stream of water round the rubber and readily find any leakage. He had taken down all the valves, cleaned, and repaired them, and was introducing larger connections in keeping with the general extensions to the works. The walls of the house were to be raised; and the present concrete roof would be used as a floor for revivifying oxide. This will necessitate an elevator and conveyors for distributing the material. The oxide used is "home made"—that is, made on the works. The old style of purifier grid is dispensed with, and is replaced by a new design of the Engineer's. A view of it is given in Photograph No. 39. It consists of an ordinary wooden grid, fixed on wooden legs about 12 inches above the floor plate; and above that is a complete box of horizontal ribs. The whole thing measures about 4 feet by 2 feet by 2 feet. This arrangement prevents the oxide dropping on to the bottom plate, and saves the men, who work barefooted, from walking in it and blistering their feet. The design has been in use for about eighteen months.

There are two station-meters; and a second governor (by Braddock) has just been erected, which will relieve anxiety in case of anything happening to the other one. Far away from home, these worries and troubles seem to appear more often than at home, where they can be repaired almost the same day.

Gasholders.

All the valves of the holders are now placed in one house, though it has taken the Engineer four years to do it, as the work had to be carried out gradually as opportunity occurred. The three holders, when seen, were well up—the Calcutta Christmas season being responsible for the maximum make of gas (1,100,000 cubic feet). The capacity of the holders is 1,717,000 cubic feet. The writer saw, in apparently good condition, an old gasholder bought from the old City of London Gas Company in 1880, and re-erected in Calcutta. It had such a heavy shell and trussing that huge counterbalance weights were attached. However, it is an old servant, and has done good service. It is seen in the centre of Photograph No. 40. A new holder lately erected to the Engineer's designs, and built by Messrs. Clayton, Son, and Co., Limited, towered well above everything. The writer's attention was called to the rivetting and other work done by native labour, and it certainly was very good.

Photograph No. 37.—Calcutta Coke-Conveyors.

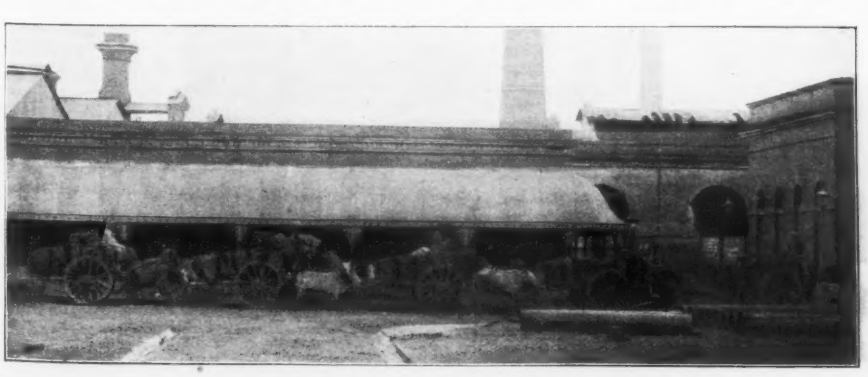
While talking, a sheep, which appears in the last photograph, strolled up and rubbed its head. This is the gas-works "pet," and is said by the natives to own the works. It has been in them for many years, and roams unmolested about the premises.

Bye-Products.

After a hospitable "tiffen," or mid-day meal, the writer had the pleasure of meeting Babu Gosto Bebary Dutt, the Chief Cashier, who has been in the Company's service for 43 years, and is evidently a valuable and trusted servant. Then the sulphate plant was inspected. It is located in a neatly-designed house, away from the general plant, and fitted with all the latest equipment. The salt was clean and white; and the attendant was proud of this being recognized. Mr. Watson finds that it is much better to work up his ammoniacal liquor if possible, even though he may not get the profits obtainable in England. He, therefore, never let this matter rest until he had made satisfactory arrangements for the delivery of the acid, &c., which was (and is) the drawback in this country.

A home-made steam-tarring apparatus for coating pipes under pressure has been introduced with great success. All old or long-stored pipes are passed through this apparatus before being used for service work; and Mr. Watson says he finds the life of a pipe in Calcutta is doubled in this way.

The mortar-mill was grinding up old fire-bricks and clinker,



Photograph No. 38.—Bullock Carts Carrying Coke.

and adjacent were the native lime burners, who just keep sufficient quantity always ready for the works' demands. This portion of the works is the building material department—all retorts, fire-bricks, timber, and requisites for main-laying excavation were arranged in methodical order, with a native to check everything. The old stokers and servants who have been many years in the Company's employ fulfil the duties of brick-breakers and sorters, which is an acceptable occupation for them in their old age.

Workshops. Machine Worship.

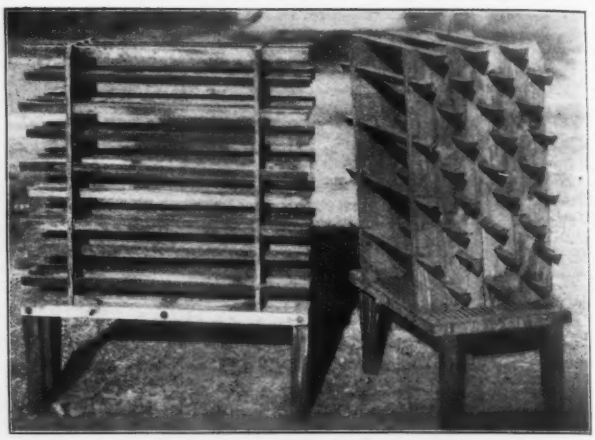
Many skilled artizans are employed in the splendidly equipped workshops—machine, joinery, pattern-making, and wood-working. There is also a crucible furnace for making small castings, when they are immediately required for a breakdown. Larger castings are supplied by local foundries, with which Calcutta abounds, as it is an engineering centre for many miles of territory. The blacksmiths' shop is a large and well-ventilated building. Formerly, the natives would not use anything but coal for these smiths' fires; but after a lot of trouble, through the usual Hindoo excuses, Mr. Watson succeeded in getting them to use coke breeze. Chinese labour is preferred in the joiners' shop, as the Chinese are very expert in wood-working of all descriptions. The stores for light goods are well organized, and have an excellent index-system of checking. Above this department is the mantle-burning room. The writer was so interested in this that he tried to take a photograph showing the three natives at work burning and hardening Welsbach mantles. The mantles are imported in boxes holding 250, and are then treated. The Welsbach Company have specially supplied a burning machine, which takes ten mantles at one time. The apparatus can be closed, and thus preserves the eyesight of the operators, as there is a blue-glass screen in front of the burners.

A visit was next paid to the spacious mess-room for the Europeans and Eurasians. It is provided with a gas-cooker, lockers, tables, daily papers, and games. The meter-repairing shop presents a unique spectacle with its straddle-legged native workmen. One noticed the gas-fired furnaces for heating the soldering-irons. Gas had been introduced much against the natives' wishes, as they adhere rigidly to old customs in their craft as in their religion.

Entering the machine shop, one is struck with the roughly painted red figure on each machine or vice. This is known as the "Poojah" mark. One day a year each native worships his machine; and the following ceremony is gone through. The natives, preceded by the priest, walk in procession through the yard to the various machines, which the priest blesses for their past favours in giving a livelihood to the men working them. In other words, the natives look on these machines and tools as their breadwinners and, as such, worship them. Prior to the entrance of the priest, the men, after a bath and food, decorate and feed their machines by laying upon them flowers, cocoanut, sandal wood, and ghee (oil). After the ceremony is over, all the machine men walk out and have a day's holiday. Even hammers and chisels, &c., are included in this ceremony, which is encouraged and subscribed to by the Engineer.

Prepayment Meter and Gas-Cooker Difficulties.

Slot-meters have been largely introduced now among the natives; but the usual patience and perseverance had to be maintained to make the scheme a success. To show how caste prejudice was the greatest difficulty and drawback in this case, it may be mentioned that the merchants and bazaar keepers were approached, and after the slot-meter had been explained to them, they would not have it at all. At last, one man was induced to try it. After some days, he brought it back to the works, saying, "Take your meter back; it is against my business interests, and it has lost me my customers and friends." He explained that the native shop-keepers had pointed the finger of scorn at him and said: "You have lost caste; the Gas Company will not trust you,



Photograph No. 39.—Special Purifier-Grid.

and have made you pay for your gas in advance." Thus the native lost his business credit by obliging the Gas Company. Meetings and lectures subsequently enabled this prejudice to be surmounted. Similar difficulties were experienced in Bombay.

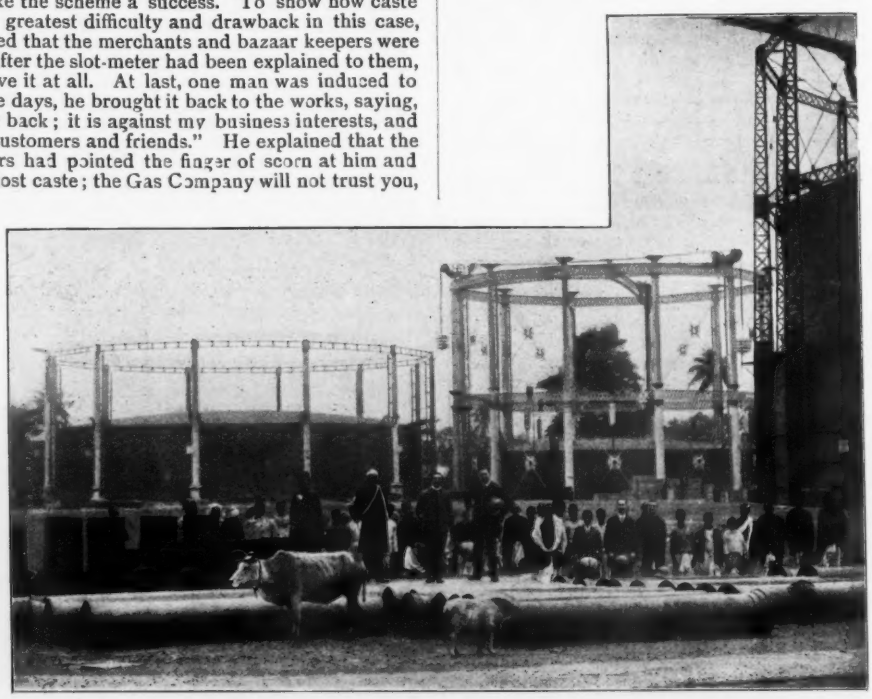
Another great obstacle to be overcome is that known as "dustoorie," which is what is meant by the more respectable name of commission. The servants in all households are divided up into various grades or castes, and have their separate duties to perform. The cook, for instance, is usually given so much for the day's food; and when purchasing he gets "dustoorie" for himself, as also on oil, coal, and coke. But he cannot get it on gas; and so the native servant will do his utmost to make the gas-cooker a failure. The food is purposely cooked badly by it, until the master in desperation is obliged to return the cooker. Where it is retained, the wages bill has to rise, so as to compensate for the loss of the servant's "dustoorie."

Howrah Gas-Works.

Howrah is a town on the opposite side of the river to Calcutta, and has a population of 160,000. It is a large mill district; and owing to it being the terminus of various railways, it really acts as the railway station for Calcutta. So all passengers and goods have to cross the bridge over the Hooghly River to reach Calcutta. The town of Howrah is splendidly lighted with incandescent gas-lamps, and the Oriental Gas Company have a branch gas-works there, of which a general view is given in Photograph No. 41.

"The Man on the Spot."

There does not appear to be much difference between gas apparatus at home or abroad. Although technical news may be two or three weeks later, it is still the same news, and the same descriptions of the latest meetings, inventions, and improvements; so that an engineer abroad is kept thoroughly up to date and can discuss any gas topic broached. The manager abroad, moreover, has more responsibility given him in taking the initiative. He

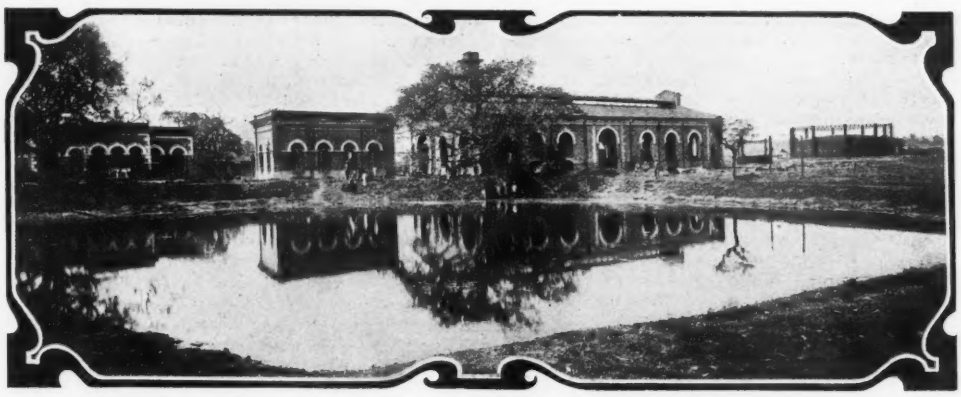


Photograph No. 40.—The Gasholders and the Gas-Works "Pet."

is not bound and fettered by a corporation, chairman, and committee. He acts as engineer, manager, and general agent, who has been appointed to govern and administer the company's property and assets. He has a thousand-and-one things to attend to "on the spot," which must be done at once, so as to retain the company's prestige and increase the company's consumers, and thus strike a blow at any competitive light. The days of the easy-going Colonial Britisher have gone. Therefore, "The Man on the Spot" is the cry to-day in every business. Concerns cannot be conducted succesfully when daily routine has to be discussed with an office thousands of miles away.

All this has undoubtedly been thoroughly thrashed out by the experienced Directors of the Oriental Gas Company, as they evidently place entire faith in Mr. Watson's local administration of their affairs. His force of character and administrative capabilities impressed the writer very much. Every opportunity is taken to improve the Company's position and extend their interests. Mr. Watson's social connections and friendly intercourse are conducive to success and to the prevention of friction, which so often abroad is the cause of endless trouble to a gas company. He also takes an interest in municipal work, and is one of the nominated Committee who govern the affairs of his district.

To sum up this description of these gas-works (which offer a very sound and steady investment in an undertaking second to none), the writer concludes with the expression of his thanks to the Engineer and Manager for personal kindness and hospitality, and with the remark that the Directors of the Oriental Gas Company have in Mr. Watson the right man in the right place.



Photograph No. 41.—General View of the Howrah Gas-Works.

USE OF COAL-TAR HYDROCARBONS FOR INCANDESCENT LIGHTING.

In the review of the proceedings at the recent congress of the Société Technique du Gaz en France which appeared in the "JOURNAL" last week, it was mentioned that among the papers set down for consideration was one by M. Denayrouze, on the above subject. The paper had been accepted and printed; but when the author went on to the platform to read it, he was not allowed to do so, as he had not brought forward anything new, nor had he given the members any results which they could discuss. This led to the single unpleasant incident of the meeting. As, however, in defending his position, M. Denayrouze made a fairly long speech, and as his paper was doubtless in the members' hands with the rest, it may be of interest to give our readers an indication of its contents.

The author commenced by drawing attention to the profitable application which can be made of hydrocarbons obtained as a bye-product from coal tar as the means of producing illumination of the Welsbach type. Reference is made to the early use of alcohol, petroleum, ether, and other sufficiently volatile hydrocarbons obtained from other sources than coal.

In France, carburetted alcohol has been but little employed, although the last two years have seen its return to some degree of favour as a motive power. In the Argentine Republic, the same liquid has been most successfully used for lighting. Many of the towns around Buenos Ayres are illuminated by this means, and the capital itself includes more than 2000 public lamps using carburetted alcohol. In France, on the other hand, the direct combustion of benzol in such lamps has become practicable during the past year; and benzol has also been used as a motive power under good conditions. In Paris, Lusol lamps are being used in the public streets, in place of gas and electricity; and it has been generally admitted that the benzol incandescent burner will bear comparison with other similar sources of light.

Benzol, however, is not the only hydrocarbon obtained from the distillation of tar up to the temperature of 250° C. Other hydrocarbons recovered from this source may be used economically in one or other of the classes of burner—those working with and those without pressure. In the first case, the consumption of the lamps does not reach 10 gms. per carcel-hour; in the second case, it amounts to about 5 gms. on the average.

In order that the gas industry may obtain a proper opinion as to the extension of their business by the employment of these hydrocarbons, four facts must be established: (1) If the consumption of a fluid illuminating liquid obtained directly from tar falls between one gramme and half a gramme of the liquid per candle-hour. (2) If this liquid can be produced readily and in fairly considerable quantity. (3) If it is less inflammable than petrol. (4) If under present conditions it costs less (much less) than any other similar product.

From some laboratory work and experiments on a small scale certain commercial facts answering the above questions have been ascertained. From one tonne of gas tar 20 to 25 per cent. of its weight of illuminating liquid can be obtained according to the quality of the material. At the same time, a residue amounting to from 50 to 60 per cent. of pitch is obtained. Its quality may be fairly described as "*demi-gras*." The illuminating liquid is lastly submitted to a chemical process of purification, which removes from it certain injurious constituents. Then the 50 per cent. of pitch thus obtained is at least worth as much as the original tar; and the conditions of manufacture, therefore, should justify a very low price for the illuminating liquid. The fact that from 5 to 10 gms. of the latter suffice to produce one carcel-hour, should show a favourable aspect of the question.

In short, each tonne of coal yields at least 50 kilos. of tar, which in turn produces 10 kilos. of illuminating liquid capable of giving at least 20,000 candle-hours. Compare this result with the record of (say) fifteen years ago—in the days of open-flame burners, which gave only 100 candle-hours per cubic metre of gas; the tonne of coal giving a little less than 300 cubic metres. The whole of this gas would not give double the light which one can now obtain from its tarry residue.

There are many evidences of the policy of electric companies to carry their supplies into the country—a department of business with which the gas companies, armed with a method such as that of incandescent lighting with a cheap illuminating liquid, can successfully compete.

A Standard Tape Recorder.

We have received from Messrs. Alexander Wright and Co. a booklet giving illustrated particulars of the Simmance and Abady new patent standard tape recorder, which is a simple adaptation of the tape machine for recording pressure or vacuum for all purposes. It is claimed for the instrument that it is of scientific construction, so that absolute accuracy over every part is ensured. It is made with a continuous chart, which only requires changing every 60 days instead of every 24 hours; and the record made can be snipped off at any convenient period, so that one for 24 or 48 hours or for 7 days can be obtained at will. The recorders are of English manufacture, and are made in various ranges—that is to say, they are made to show on the one hand as low as 1-50th of an inch head of water, or, on the other hand, a pressure of 20 atmospheres. The instrument is generally considered a distinct step forward in the matter of recorders.

Procedure on Provisional Orders.—A Bill has been introduced into the House of Lords to enable rules to be framed to regulate the procedure with respect to Provisional Orders made by the Board of Trade. Experience has shown that the existing statutory requirements have led to considerable inconvenience and expense, and in the case of many small gas undertakings have had the effect of deterring the owners from seeking statutory powers. It is proposed to repeal the provisions of the General Public Acts which prescribe procedure, and make it subject to the Board's rules.

EXAMINATIONS IN "GAS SUPPLY."

[COMMUNICATED.]

THE recent examinations in "Gas Supply" under the City and Guilds of London Institute, were the first held in this specialized subject. The object of the examinations is to promote technical training among distribution employees; and no doubt each succeeding year will find an increasing number of aspirants for the certificates awarded to the successful candidates. Some notes, therefore, on examinations in general, and this one in particular, will not be inappropriate at the present time.

To begin with, a large majority of young men who go in for the examination will, or ought to be, already engaged on the outside staff of some gas undertaking. Too often the general education of such has not extended beyond the elementary grounding in the "Three R's" which is to be obtained in the public elementary schools. The remarks which follow, therefore, are directed to the end of showing such how best to utilize the limited time allowed for answering the questions which form the test of their knowledge of the subject.

Everyone is practically agreed that the method of ascertaining the relative merits of candidates by time-limit examinations is far from perfect. Up to the present, however, no more practical method that is capable of anything like general application, has been evolved. It has been often asserted that the smartest penman has a great advantage over the candidate whose pen, through lack of practice, moves slowly over the foolscap sheets. This is not necessarily the case; and it only needs a few moments' reflection to realize this. Take, for example, the examinations in "Gas Supply." Four hours are allowed for answering eight questions. If a candidate has been thoroughly prepared, by self-culture or otherwise, he will not need to take up more than 50 minutes in thinking over the questions, and (say) 30 minutes for any sketches that may be considered desirable to enhance the value of the answers. For the actual exercise of writing out the answers, there is left an average of 20 minutes per question, or sufficient to record 300 words at an average speed of 15 words per minute. It may be taken as a safe guide that no reasonable examiner expects more than this, if the matter is of the right stuff; for the majority of questions can be adequately answered within these limits.

Although the author would not go so far as to say that students who cannot write at the rate of 15 words per minute should not enter an examination of this kind, he would strongly counsel them to practise until they can write legibly at this rate. When it is remembered that some writers can attain a speed of over 30 words per minute, it will be realized that there is nothing abnormal in the suggestion here made. Mere words as such have no value, of course, in the eyes of an examiner—everything depending on their appropriateness to the question in hand. It is on this point (of confining answers strictly within the limits of the respective questions) that so many candidates get "off the rails."

The temperament of an examiner is obviously a factor to be considered; and he is hardly likely to be in a mood for "marking-up" an answer if the essence takes as much finding as the proverbial "needle in a haystack." Brevity, therefore, consistent with an adequate answer, is essential. Some candidates make a point of thoroughly studying or memorizing the chief points connected with the technical work, articles, or speeches emanating from an examiner, and without the slightest provocation introduce references to the same in one or more of their answers. The result is to absolutely defeat the end the candidate has in view—a highly marked paper to wit. There is no harm being conversant with an examiner's professional work—foibles if you like—but no reference should be made to it unless "arsked."

The instructions should be read carefully, and the number of questions to be answered should not be exceeded. Violation of this rule may not disqualify a paper; but it will certainly result in a greater penalty than if the number of questions to be answered were not exceeded. The instructions accompanying a paper are, as a rule, quite clear, and should be strictly observed. Each question is identified by a number. It is sheer waste of time, therefore, to repeat the question on the foolscap provided for the answers. The number is quite sufficient for an examiner to correctly allocate the answers to the questions attempted. The candidate should first of all read the questions through carefully, and tick off (say) the first four that commend themselves to him as easiest. He should then answer these forthwith. Having completed them, he should again read through the remainder and select the last four to make up the complement of eight questions. It is very important that the candidate should attempt first those questions he is best qualified to answer. Time wasted at the outset on difficult questions has brought disaster to many an able student; the clock having got home "an easy first."

With some diffidence the writer now proceeds to show how the recent paper on "Gas Supply" might have been answered. Having had a considerable amount of experience in years gone by as a candidate in various examinations, and later as a teacher and examiner in various technical subjects, it is hoped that they will be of some use to that numerous body of young men who are about to pass through the ordeal of examination in "Gas Engineering" or "Gas Supply," and who, in so doing, obtain their first real baptism of examinations. Many candidates, of course, will "know the ropes" pretty well; but even among old stagers it is surprising to frequently find that method and condensation are largely absent from otherwise excellent answers.

ORDINARY GRADE.

1. Of a service 100 yards long, the first 50 yards are laid with a total fall of 5 ft., and the remaining 50 yards with a rise of 8 ft. What provision is necessary to ensure a satisfactory supply? If the pressure at the main is 2½ in., what will it be at the end of the service, ignoring fractional losses? (*36 marks.*)

A cast-iron bottle syphon should be placed at the lowest point in the service to receive the products of condensation; thus avoiding a blockage. The syphon would be connected to the service by means of a T-piece, and a ½-inch or ¾-inch pipe, capped with a plug, fitted to it, carried near to the road surface, and protected by a street-box. This pipe is required for the purpose of pumping away the condensed products.

The net rise in the service is 8 ft. – 5 ft. = 3 ft. As pressure increases 1-100th of an inch for every foot rise, and as the pressure at the main is 2·5 inches, at the end of the service it will be 2·5 + ·03 = 2·53 inches.

2. Enumerate six distinct causes of insufficiency of supply to residences, and the remedies to be applied in each case. (*36.*)

(1) Service too small.—A portable pressure gauge will indicate this, and a service big enough to ensure a pressure of from 15-10ths to 20-10ths at the meter should replace the defective one.

(2) Waterlogging.—The service having been laid correctly in the first instance, this is usually due to subsidence. The waterlogging being located, the service should be cleared and relaid on a bed of concrete, or in a V-shaped trough. It may be advisable to insert a bottle syphon, as described in answer to Question 1.

(3) Naphthalene.—This can be cleared by means of a force pump and benzol, naphtha, or petroleum. The benzol is poured into the force pump and blown into the service by air pressure, the naphthalene being dissolved out and flowing as a liquid to the nearest syphon.

(4) Breakage or corrosion.—Shortage in this case is caused by gas escaping, and the source is traced by the sense of smell, uncovering pipe, or in longer services by using an indicator. The faulty pipes should be taken out and replaced, while if the fault is due to ashes or acidity in the soil, V-shaped troughs filled with pitch should be used to protect the pipes.

(5) Defective meter.—Faulty floats in wet, and defective diaphragms in dry meters, are the chief causes of shortage due to meters. In either case the meter must be removed for repairs, and an accurate one substituted.

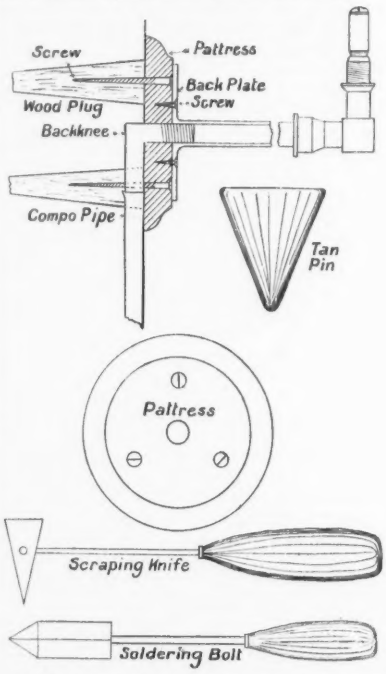
(6) Initial pressure too small.—To accurately diagnose this, it is advisable to take a number of readings in various parts of the district affected, by means of a portable pressure register. These will show whether a greater pressure should be maintained at the station governor or larger mains laid.

3. Describe fully how, on completion, you would test for leakage (*a*) the soldered joints of a gas-meter, (*b*) the joints of a 6-inch gas-main, and (*c*) the soldered joint of an ordinary gas-bracket. State how the bracket is usually fixed, and show, by simple sketches, the tools used and the fittings required to complete the work. (*36.*)

(*a*) The meter being connected at the inlet to the gas supply, and the outlet to a piece of pipe with a dead-end, leakage may be detected either by painting with soap water or by observing the small dial of the meter.

(*b*) If valves are unavailable for isolating the main to be tested, each end must be stopped by inserting through holes drilled for the purpose two gas-bags, allowing (say) a space of 2 feet between each bag. This space is filled with water as an additional precaution. The test may then be made with one of Milne's air compressors, using a pressure of not less than ½ lb. per square inch. The required pressure being obtained, the taps on the compressor are turned off—any leakage being indicated on the gauge. The escape may be located by painting with soapy water, if the trench is open.

(*c*) By connecting a small force pump containing a small quantity of ether to the pipe near the meter, an escape at the bracket (if any) will be detected. All the taps on the brackets, &c., are turned off; ether vapour under pressure is pumped into fittings; and if there is any leakage it will be betrayed by the odour. Assuming the other fittings to be tight, the leak will also be indicated by the small dial on the meter.



To fix bracket.—Let the compo. supply pipe into the wall, and fix in desired position with holdfasts. Plug the wall with three small square plugs. Determine correct position for bracket,

and cut compo. pipe to suit. Slightly open pipe with tanpin, sufficient to allow the plain end of a brass elbow (backknee) to be inserted. Scrape pipe inside with shaving knife to get a clean surface. Place the elbow, which has been previously tinned by means of a coating of solder and resin, in the open end, and put a small quantity of resin and oil round. Then work sufficient solder neatly around to form a joint, by means of a soldering bolt. When completed, the thread of the brass elbow will project at right angles to the face of the wall. Pass this end through a pattress, and securely screw the latter to wood plugs in wall. The screwed end of elbow must then be smeared with white lead and the bracket screwed on it; the brass plate of the latter being fixed to the pattress with three screws.

4.—What are the chief points to be observed in the working of a gas-engine if economical running is to be ensured? (*36.*)

The chief points to be observed are—

(1) Efficient lubricating, and the use of a good quality gas-engine oil for the cylinder, and the best machine oil for the bearings.

(2) The bearings should be properly adjusted, and the engine kept clean.

(3) The mixture of gas and air should be properly regulated in the proportions to suit the quality of gas.

(4) An efficient governing device should be fitted to the engine.

(5) The gas supply pipe should be of ample size, with a pressure regulator or anti-fluctuator fixed thereon.

(6) The condensers should be large enough, and the cooling of the cylinder carefully adjusted so as not to lower its efficiency. The jacket should be occasionally cleared of deposits from the water.

(7) The admission and exhaust valves should be kept well ground in with emery powder, and be free from carbon deposits. Leaky valves cause loss of compression and trouble from misfiring.

(8) The springs should be tested occasionally.

(9) Piston rings should be well oiled, and worn rings renewed.

(10) If ignition is by electric sparking, the points should be clean and bright, and the battery kept to strength; if by ordinary gas-jet, it should be just large enough to keep the tube at the required heat. Correct timing of ignition should be secured, and an arrangement for timing, particularly on large engines should be provided. This should be calibrated with the assistance of indicator diagrams.

5. If you were called to a consumer's residence to remedy a faulty fire-clay "fuel" (asbestos) gas-fire, how would you proceed with the work? What precautions are necessary in arranging the "fuel" in order that freedom from smell and high radiation efficiency may be secured? (*36.*)

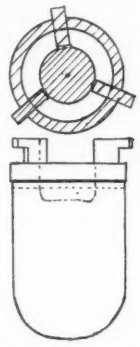
I should ascertain if the pressure of gas was sufficient (15-10ths minimum), then observe the arrangement of fuel, take out same, see if the bunsens were in order, and thoroughly clean burner. The gas and air should be adjusted so as to have a flame with two cones converging into one, which is almost noiseless. The flue should then be examined and cleaned if necessary. There should be no down-draught after the fire has been lit (say) ten minutes.

In order to obtain freedom from smell, the fuel should be placed not less than 1½ inches from the burners, and so fitted that the flame passes up the space which is left centrally in all permissible gas-fire fuel. Carbon monoxide is generated when flames come into contact with cold surfaces; hence the importance of avoiding direct contact with the flame as much as possible.

High radiating efficiency is best secured by having a large vertical surface of incandescent fuel, rather than a relatively large depth (back to front). There should not be an excessive vacuum in the flue, or large volumes of cold air will be drawn over the fuel and lessen the radiation therefrom. The front bars of the fire should be as unobstructive as possible. A Wilson reflector in front of the fire deflects rays into the room that would otherwise be lost in the hearth.

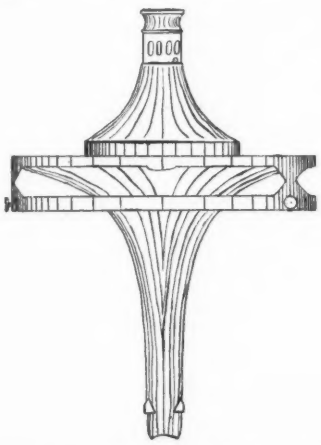
6. (A) Explain, and illustrate by simple sketches, what devices or means are employed in the construction of inverted burners for dealing with the products of combustion so as to prevent (*a*) deposition of soot on the mantle, (*b*) commingling with the primary air supply, and (*c*) impingement on the burner fittings or pendants. In each case give reasons why the devices are necessary for efficient results. (*39.*)

(*a*) In order to prevent the deposition of carbon on the mantle, the combustion products must be allowed to escape from inside the mantle without having to pass through the mantle itself. Space must be left for this purpose between the burner-head and the mouth of the mantle thus—

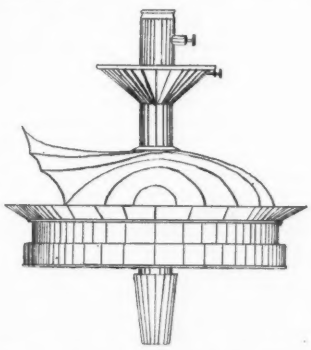


The gas and air must be correctly proportioned.

(*b*) To prevent commingling with the primary air supply, Mannesmann designed a burner having a horizontal flange above the orifice, in order to deflect the combustion products from the primary air inlets; and Bernt and Cervenka so devised an inverted cone in their burner as to effect the same purpose. One arrangement for achieving this end is here shown—



(*c*) The arrangements described in (*b*) largely protect the fittings or pendants. The deflecting cone for diverting the combustion products from the primary air supply is in some types of burners enclosed at its upper parts; an orifice being left at one spot only in the side wall of the jacket in order that the products may escape locally in a direction which carries them away from the primary air inlets, and also from burner fittings, thus—



Such deflecting device is usually made to rotate about the main tube of the burner, so that the combustion products may be kept away from pendants and brackets. Another device (Eisner's) is to fit the horizontal top-plate of the burner with several openings, all of which, save one, can be closed by a revolving plate.

Reasons.

(*a*) With no annulus between the burner-head and the mantle ring, it is obvious that the inert combustion products, as well as soot deposits, must reduce the illuminating power, and the flame of the bunsen, in its search for oxygen, will become elongated, with unsatisfactory results.

(*b*) The greater the percentage of oxygen in the primary gases, the less the proportion of inert matter and the higher the flame temperature, and, as a rule, the greater the luminosity. Combustion products mixing with primary air must, therefore, have deleterious results.

(*c*) Tarnished burner fittings and pendants, while unobstrusive in the gas light, are an eyesore by day. The prejudice of consumers must be avoided, and therefore only burners can be considered properly designed that avoid it. In addition, the burning-away of parts, and causing leakage, must be prevented.

6. (B) Explain the functions of (*a*) the ejector, (*b*) the cone-deflector, (*c*) the mixing-tube, and (*d*) the wire gauze or enamel burner-head, as applied in incandescent burners. (*39.*)

(*a*) The ejector is the part of an incandescent burner which forms the outlet for the gas required for combustion. It is usually constructed centrally with the primary air inlets, in a similar manner to an ordinary bunsen-tube. Its function is to induce by velocity a sufficient inflow of air to ensure the requisite mixture for complete combustion and the maximum illuminating power at the burner-head. To do this satisfactorily the orifice should be concentric with the bunsen-tube, and perfectly round.

(*b*) The cone deflector is a device in inverted burners for, as its name implies, deflecting the products of combustion away from the primary-air inlet and the burner fittings or pendants.

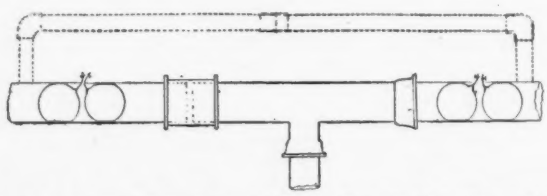
(*c*) The mixing-tube is used for ensuring that the gas and air are thoroughly mixed before reaching the burner-head, so that combustion is regular and complete. Tubes constructed to increase velocity are the best.

(*d*) The wire gauze or enamelled burner-head is a device used in upright incandescent burners to prevent flashing-back when the burner is lit.

7. (A) How would you carry out the operation of fixing a T-branch in an existing gas-main, (*a*) with, and (*b*) without, stoppage of the flow of gas through the main? (*39.*)

With supply stopped.—Warn consumers in the district affected that the supply is to be stopped, and see that all tools, &c., required are on the spot. Arrange for the works pressure to be reduced, if necessary. The work should be carried out in the early hours of the day, so as to reduce to a minimum any obstruction of traffic. Arrangements being made, the main is bared and the position of the T-piece indicated on the existing main. It is necessary to allow (say) 1 inch at each end, to slip the T easily into position when the piece has been cut out. A narrow groove is then cut round the main, at the position marked, with a gouge or diamond point; care being taken to have the groove at right angles to the axis of the main. [A better method of cutting out is to use Jones's pipe cutters, if convenient.] During this time, holes are drilled through the main for inserting gas-bags. These must be placed 2 to 3 feet away from the ends cut, the size of hole being determined by the size of the main. The bags are inserted and inflated. As an additional safeguard against escape, two bags are put into each hole, and the space between the two filled with water. The cut piece is broken out clean by means of cold setts, chisels, and a wedge if necessary. The collar is then slipped over one end of the main, and the socket of the T-piece fitted over the other end. The collar is now so placed that the small space left between the spigot end of the T-piece and end of the main is exactly central to it. The joints at the collar and socket of the T are then run (open lead type) and finished off in the usual manner. A small hole is then drilled in the outlet of the T, and a bladder inserted and inflated. The four bags previously used may now be removed and the holes plugged.

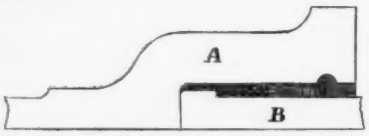
With supply maintained.—The method of procedure up to a few years ago was to make a temporary bye-pass (as sketch, p. 32) previous to the insertion of gas-bags; holes being bored for the bye-pass pipes (the size depending upon the size of the main). This method has now,



to a large extent, been superseded by Ruscoe's patent drilling apparatus and an ordinary split collar with a T-outlet. The collar-piece is cast with flanges, between which a thin strip of sheet lead is placed, to make-joint. Two lugs are cast on to the T outlet in order to secure the drilling apparatus. The split T is bolted to the main in the required position, the drill inserted into the outlet, and made secure. (The drill is so constructed so as to make a tight joint with the socket on the T outlet). Then the collar is jointed on to the main on the open lead principle, after which the drill is brought to work and the piece cut out. This being done, the drill is partly withdrawn, a bladder is inserted in the outlet of the T, and finally the drill is fully withdrawn, and the work is completed.

7. (B) Describe two forms of low-pressure gas main joints, and explain their relative advantages and disadvantages. (*39.*)

Two forms of low-pressure gas-main joints are the "open lead" and the "turned and bored."

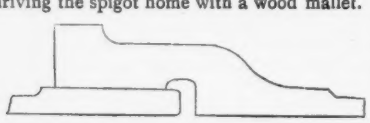


Open lead joint.—The accompanying sketch shows the open lead joint. The spigot B of one pipe is inserted into the socket A of another, and knocked well home with a mallet. [The spigot is usually cast with a narrow belt round it, so as to prevent the yarn passing through into the pipe. It is also advisable to have a small groove formed round the interior of the socket, to prevent the lead ring being drawn when pipes are affected by weather or other causes.] Two or three rings of tarred yarn are then pressed into the space between the interior of the socket and the exterior of the spigot, by means of the yarning iron. Then a clay band, or preferably a pipe clip, is placed round the face of the socket; leaving a lip at the upper side in which to pour the lead. In wet weather it is advisable to run into the space where the joint is to be made a little tallow or oil, to prevent the lead from vaporizing any water collected on the surface of the pipe and spurting—a source of danger to the operator. The joint is run (advisedly at one pouring), allowed to cool, the clay collar or clip removed, and the superfluous pieces of lead chipped off. The joint is then caulked by setts of various sizes, and subsequently tested for soundness.

The advantages are: (1) Flexibility, (2) will stand vibration and deflection, (3) a length of main may be deviated, within limits, from the straight line without fear of leakage occurring.

The disadvantages: (1) Rather costly, (2) the iron and lead have different co-efficients of expansion, so that in summer and winter the expansion and contraction of the metals differ with the possibility of a very small aperture being formed between the lead ring and the iron of the socket or spigot, resulting in an escape of gas.

Turned and bored joint.—In this type of joint, the interior of the socket is faced-up true in a lathe to a definite bevel, usually about 1 in 32. The spigot end is also faced up to exactly fit. (See sketch.) The pipes being in position, the socket and spigot are smeared over with red lead, and the joint completed by driving the spigot home with a wood mallet.

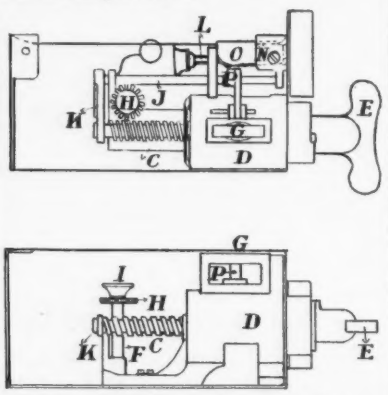


Advantages: (1) Cheaper and easier to make, (2) saving of time and labour.

Disadvantages: (1) Very rigid, (2) deflection impossible, (3) liable to fracture if a subsidence should occur, or if subjected to strain through heavy traffic, &c., (4) more specials required if main has to be deviated, (5) pipes more costly.

8. (A) Describe fully the working of one form of slot mechanism as applied to a dry meter. Is there any difference between the slot attachments of dry and wet meters; and, if so, in what respect? (*39.*)

One of the simplest forms of slot mechanism is devised as per sketch.



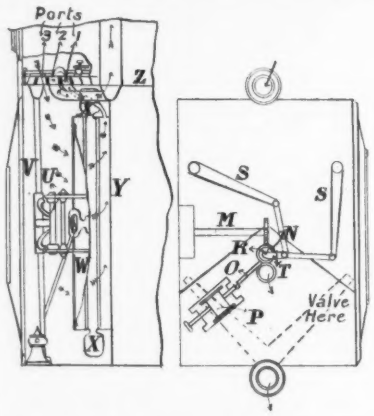
A reciprocating screw C, supported at one end by a brass bearing, and passing into the coin-chamber at the other end, is slotted at the latter end. In the coin-chamber D is an internal sleeve attached to the handle E, and having a projecting arm. When the penny is inserted at G, it drops into the slotted extension of the screw C, and when the handle is turned, a catch on the latter causes a locking action between the screw C and the handle E. The screw C engages with a toothed wheel at the opposite end to the coin-chamber, and is fitted on a vertical axis F. The upper part of F carries the change-wheel H, which determines the quantity of gas allowed per penny. This latter wheel is geared directly to a worm attached to the main index wheel of the meter by a long shaft. It will be seen that it is an easy matter to remove the change-wheel if required —*i.e.*, by taking off the cap I. There is also a horizontal spindle J, supported on bearings. The spindle runs parallel to the screw C. The screw C and spindle J are put in communication by a crosshead K. The spindle J moves with the screw C. A forked arm at the coin-chamber end of the spindle J communicates with a spindle L; the latter being connected to the controlling valve. A projecting pin from the forked arm works in a spiral groove N formed on the barrel of a parallel spindle O, causing a bent lever P to obstruct the coin-slot when the maximum amount has been prepaid.

When the penny is inserted, the handle is turned, and the screw C moves outwards, carrying with it the spindle J, the forked arm on which pushes in the spindle L slightly; thus opening the valve. When gas is being consumed, the shaft connecting the change-wheel H and the main wheel of the index shaft revolves, thus rotating the change-wheel. Consequently, the toothed wheel on the same shaft as H also revolves, and gradually causes the screw C to work back towards the coin-chamber, carrying the spindle J with it, and gradually closing the valve, which is completely closed when the amount prepaid has been consumed. It is possible to insert twelve pennies at a time; the penceworth prepaid being registered on a small dial in front of the meter.

In a wet meter, the slot attachment is connected to a worm at the top of the vertical spindle which connects the axis of the drum to the registration shaft; the vertical spindle being slightly elongated to carry a worm. In a dry meter, the slot attachment is connected to the horizonal registration shaft.

8. (B) Describe the construction and working of a dry meter, with special reference to the mechanism by which the gas is registered. What are the chief points upon which accuracy of registration depends. (*39.*)

Construction.—A dry meter consists of an outer case, rectangular in shape, made either of tin or cast iron, and divided into three compartments by two partitions, Z and Y. Z runs horizontally from side to side of the outer case, and divides the valve-chamber and mechanism from the other portion of the meter. Y divides the lower portion of the meter vertically into two equal compartments. To this partition is fixed (one on each side) a circular metal rim, and to the rim is securely attached one edge of the flexible diaphragm X. To the other edge of X is secured a metal plate W. Thus it will be seen that W and X enclose a space which forms one of the measuring-chambers. Wires are connected to W, and these pass into slots on the base of the meter, always keeping the motion of the diaphragm in the same plane.



The space in each chamber formed by the partition Y which is not taken up by diaphragms X are also in themselves measuring chambers. When gas enters the diaphragms, they become inflated, and move outwards horizontally. This motion is conveyed to the flag rod V by the flag piece U. V and U will convert the horizontal motion of the diaphragm into a partly circular one, which is performed by the flag-rod; the latter turning partially round in its socket. A stuffing-box is provided in the partition Z on each side of the meter, for the purpose of running the flag-rods through into the upper chamber of the meter. From the tops of these flag-rods two arms S are placed horizontally, and are connected by a tangent T to the crank-shaft R, which works through a stuffing-box, and is connected to the valve covers P by the arms O. In this way the valves are actuated. The valves (of which there are two) are composed of a cover (capable of covering only two ports at once) and three rectangular ports, which are let through the partition Z. One port communicates with the inside of the diaphragm, another (the centre one) leads to the exhaust or outlet pipe, the third is the inlet to the measuring chamber outside the diaphragm. By means of the arms S, the motion of the flag-rod is converted into a rotary one in the crank-shaft, the upper end of which carries a worm N, the latter transmitting motion to the main index shaft M, and thus, by a series of cog-wheels fitting into each other, the gas is registered.

Working.—The gas enters the meter at the inlet pipe, and passes along a tube under the partition Z and up through a port into the valve-chamber. Then, assuming that the port (to the outside measuring chamber) of one of the valves is open to the gas, the latter passes through into this chamber and exerts a pressure upon the metal disc of the flexible diaphragm, causing the latter to collapse, and expelling the gas from it through No. 1 into port No. 2, which is the exhaust. The valve cover during this time has covered ports 1 and 2; and the diaphragm on the other side of the partition Y has been filling and expelling gas from its corresponding outer measuring chamber to the exhaust port. Thus it will be seen that the flexible diaphragms fill and discharge alternately, and the diaphragms, by their respective flag-pieces and flag-rods, give rotary motion to the crank-shaft R and turn the index-shaft M. The chief points upon which accuracy of registration depends are: (1) Quality and state of the diaphragm, (2) fitting and accurate working of the valves, (3) the best materials must be used in the manufacture, (4) should not be fixed in places subject to any very great variations of temperature.

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9. (A) Describe fully one form of wind and storm proof lantern, and show, by sketch in

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and the family likeness is often very strong

The "EUREKA" was the first Cooker
with enamelled exterior.

The "EUREKA" was the first Cooker
with lifting top.

The "EUREKA" was the first Cooker
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was tried **ENTIRELY WITHOUT SCREWS.**

WE QUICKLY ABANDONED THE SCREWLESS PRINCIPLE

WHY?

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The present-day "EUREKA" is as nearly screwless
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Beyond that point the fewer the screws the worse the Cooker.

Those who may experiment with the screwless method now,
will, as they gain experience, **find out their mistake.**

The "EUREKA" is not a new-fangled experiment.
It is not merely well *THOUGHT OUT*, it has been carefully *WORKED OUT* in practice.

It stands to-day as the ***result*** of ***many years' experience, test,*** and ***patient perfecting.***

The "EUREKA" is not IN the front rank—
The "EUREKA" IS the front rank.
YOU are always **safest** *with the* **best!**

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THE CENTENARY AIR GAS PLANT.

One self-contained, simple, and safe closed vessel, having only one movement.

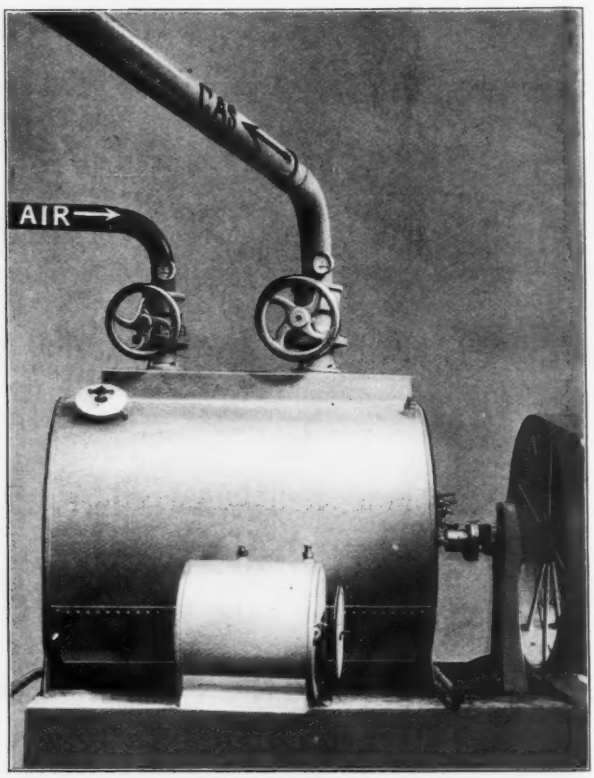
The acme of engineering effort to give the best and cheapest Gas Apparatus, and now introduced to consumers on the CENTENARY of the first lighting of public thoroughfares by its prototype, Coal Gas,

100 YEARS AGO.

The Illustration shows Machine capable of giving 20,000-Candle Power for 15 hours without refilling Petrol Reservoir.

Small Machine 500-Candle Power per Hour.

1000 Cubic feet of Gas for One Shilling.



Prices,

Including Weights or other driving power.

7 cubic feet per hour = 1 Light.

10	Lights ...	£25
20	,, ...	£35
40	,, ...	£47
100	,, ...	£120
200	,, ...	£175
400	,, ...	£250

20,000-Candle Power at 2s. per hour for Petrol.

For Villages, Rising Districts where expense for Gas Mains from nearest Town would be prohibitive, Factories, Mansions, Hotels, Churches, Schools, and Greenhouses. Air Gas does not injure Plants.

Can be fitted as a cheap auxiliary to Electric Lighting plants which have become too small, and to extend them would cost several times over the price of a CENTENARY Air Gas Installation, the light from which costs only $\frac{1}{7}$th that of Incandescent Electric Lighting.

The Gas is permanent, no Condensation, even through miles of Underground Mains, not even in severe frosty weather.

The Petrol Feed is adjustable to the atmospheric temperatures.

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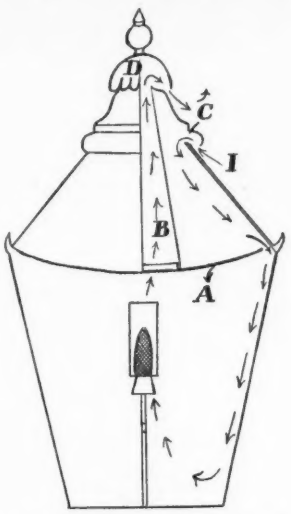
A FEW AGENTS WANTED.

sectional elevation, how the wind-proof efficiency is effected. (*39.*)

In a wind and storm proof lantern, the chief points to observe are that rain and wind are prevented from getting into the lamp (thus destroying the mantles), and that sufficient air is allowed to enter for combustion. Also adequate outlet should be made for the products of combustion to easily escape. The lantern described and sketched conforms to these conditions.

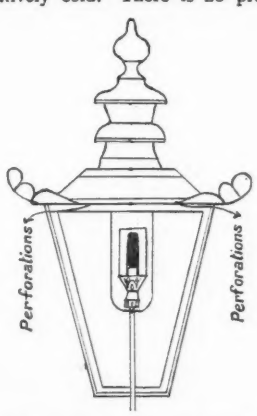


The air for combustion and for the bunsen burner enters at I under the spinning C, and passes down the inside of the lantern hood, past the edge of the reflector A, and into the lantern to the burner. The products of combustion pass up a conical-shaped chimney B, which carries them up to the canopy D, and here they escape, as shown by the arrows in the sketch. By conducting the products of combustion and air in this way, the latter gets slightly heated, and greater efficiency results. There are no direct currents of air into the lantern, and wind is baffled through having to pass under the spinning, and down the edge of the reflector. The canopy at top prevents rain getting into the lamp. This lamp is also fitted with a ball-trap door, consisting of a glass ball, about 2 inches in diameter, which runs up an inclined channel in the base of the lamp when the torch is inserted, and is kept in position by means of a guard wire. The ball when at rest lies in, and closes, the hole at the bottom of the inclined channel. The lamp should be of the puttyless type. It must be securely fixed to the column with an efficient frog.

9. (B) Give two methods by which the air of combustion is introduced into street-lanterns, and discuss merits of each. (*39.*)

(1) In the hood of the lantern above the reflector, as in the case of the lamp sketched in answer to No. 9 A. (2) By perforations in the waist of the lantern, and at the bottom.

The merits of the former method are: (1) The incoming air is slightly heated through coming in contact with a surface heated by the products of combustion, thereby increasing the efficiency of the burner. (2) The air supply to the burner is not contaminated with the products of combustion, which would reduce the efficiency of the burner. (3) The air is baffled by having to pass into the hood of the lantern and down the side of the reflector, and therefore there are no direct currents on to the burner. (See sketch in answer to No. 9 A.) In the second method, the air is admitted by means of perforations in the waist of the lantern; and at the point of combustion it is comparatively cold. There is no protection



from direct currents of air on to the burner when high winds are blowing. The air is contaminated with the products of combustion; thus reducing the efficiency of the burner. Where the air is also admitted at the bottom of the lamp the efficiency is still less than in the first method, though the air supply to the burner is not then contaminated with products.

10. In applying ventilating devices to living rooms, what general principles should determine the position of air inlets and outlets? In what way may gas be utilized to remove products of respiration above the breathing level? (*39.*)

Domestic ventilation is chiefly of the "natural" order. Though no special motive appliance is used, the forces brought into play are: (1) The wind, (2) the elevated temperature of the room as compared with outside atmosphere, and (3) the draught created by the heat from the fires. The hotter currents of air in a room rise, and the cooler currents fall. This physical truth is the chief factor in determining the position of air inlets and outlets; but there is at least one other point to be considered—viz., a current of outer air at ordinary temperatures will be felt as a draught if its velocity exceeds 3 feet per second. The air inlet of a room therefore should be as far removed as possible from the point mostly frequented by its occupants, so that such diffusion may ensue as will reduce the velocity to the accepted rate before it reaches the occupants. To this end, one or more of the extreme corners of the room from the fire-place is usually best. As cool air falls, the inlet from outside should be at the ceiling, but the air should pass down a tube reaching to within 4 feet from the floor level before entering the room. The cooler currents already in the room have been found by experiment to pass down the face of the wall, so that they will assist the incoming air to diffuse rapidly without draughts. The outlets for the hot vitiated air should be at the ceiling, and so devised or regulated as not to be converted into inlets through the heavier cool air overcoming the ascensional power of the foul air. The outlets, too, should be as far as possible from the inlets, to prevent short-circuiting. The products from burning gas are especially adapted to improving the efficiency of ceiling ventilating outlets. Even in rooms as ordinarily lighted, gas products, being hotter than the surrounding air, rapidly increase the ascensional power of the vitiated air and the egress of same. The ventilating value of gas is still further enhanced if the products discharge immediately into a tube which, with a perforated ceiling centre, may be made to form an efficient ejector; a larger tube being used to convey both products and vitiated air to the outer atmosphere or the domestic flue. The greater diffusion which takes place in gas-lit rooms ensures that respiratory products quickly pass above the height of breathing. To an extent, sterilization takes place through the large volumes of air brought within the high temperature zone of flame.

THE GAS-HEATING FIELD.

By EDWARD A. HARMAN, M.Inst.C.E., of Huddersfield.

THE prominence accorded by you to the above subject must be my plea for again referring to it. In the article published in the "JOURNAL" for Sept. 3, 1907 (p. 617), you called attention to the large field open for gas heating, and invited correspondence thereon. Among others, I contributed a quota of experience, and gave the general result respecting the differential prices for gas in vogue at Huddersfield. When reviewing the whole correspondence in a later issue (Oct. 22, 1907), you mentioned that I had not supplied figures illustrating the results. Possibly those for the past ten years may be interesting. They are as follows.

Statement of Gas Sold, &c.

Year ending March 31.	Total Gas Sold, Exclusive of Gas Used on Works.		Gas Sold for Stoves, Fires, Engines, &c.		Gas Sold through Prepayment Meters.
	Thousands.	Increase per Cent.	Thousands.	Increase per Cent.	Thousands.
1898	495,510	..	81,700	..	6,128
1899	539,546	8·88	109,741	34·35	23,715
1900	578,764	7·28	129,808	18·29	44,533
1901	560,473	..	131,801	1·53	59,152
1902	567,617	1·27	143,987	9·24	79,315
1903	562,434	..	147,663	2·55	90,987
1904	584,522	3·93	163,226	10·51	111,699
1905	604,818	3·47	178,482	9·34	130,179
1906	624,677	3·28	186,477	4·47	149,935
1907	684,953	9·66	213,025	14·21	169,999
1908	725,003	5·85	234,171	9·94	191,900
Increase in ten years	229,493	46·3	152,471	186·6	185,772

These figures are capable of many interpretations. Elements of difficulty arise in comparison, by reason of the gas employed for heating and power purposes being charged for at the same price, and are therefore combined. But one thing is clear—viz., that in the year ending 1898 the gas used for such purposes was about 81 million cubic feet, whereas in 1908 it was 234 million cubic feet, or an increase of 153 millions, which equals 187 per cent. in ten years. In addition, regard must be paid to the gas used through prepayment meters, the total of which now amounts to 192 million cubic feet. If half of this be reckoned as being used for stoves, an additional 96 millions must be added to the 234 millions; making 330 millions, or an increase of 249 millions, which equals about 300 per cent. in the ten years.

Statement of Cookers, Fires, &c.

—	Gas-Cookers.	Gas-Fires.	Wash-Boilers.
In use, March 31, 1898 (supplied by Gas Department)	180	58	..
In use, March 31, 1908 (do.)	16,264	1162	835

The total quantity of gas sold for all purposes in 1898 was 495 millions, and in 1908 it was 725 millions; being an increase of 230 millions, or 46 per cent. The prices per 1000 cubic feet of gas in 1898 were: For lighting 2s. 9d., for stoves and engines 2s. (in each case less 5 per cent. discount), and for prepayment meters 25 cubic feet for 1d. The present prices are: For lighting 2s., for stoves and engines 1s. 6d. (in each case less 5 per cent. discount), and for prepayment meters 40 cubic feet for 1d.

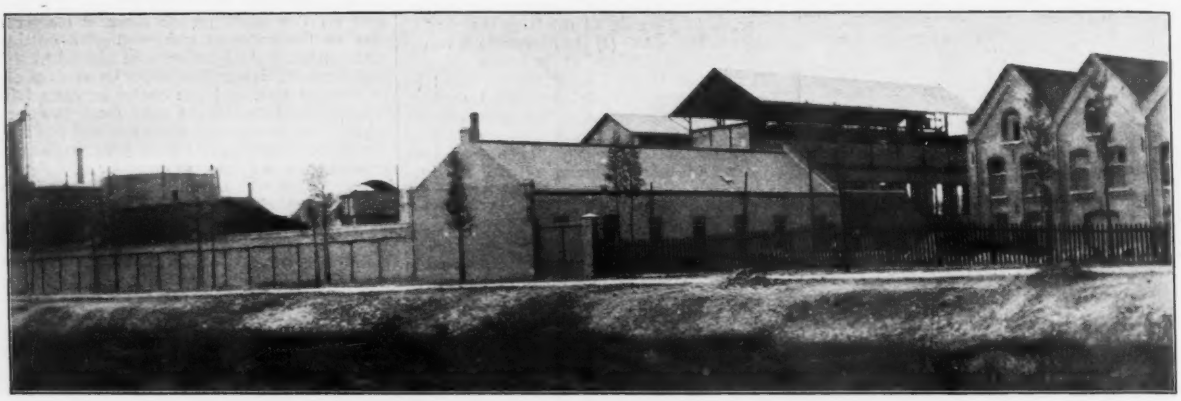
It will be noticed that the difference in price between gas for lighting and that for heating in 1898 was 9d., whereas to-day it is 6d. It may also be mentioned that my Committee have adopted a businesslike policy of letting out stoves for all purposes on very easy rentals, and they also fix the same free of charge; so that every inducement is offered the consumer to use gas for heating. All gas cookers, fires, and meters are fixed free, and the rentals are trifling.

Any item of experience which will tend to solve the problem you have frequently put before your readers will, I am sure, be welcome. If your advocacy of this most important subject will awaken interest in gas undertakings generally, with the result that extra advertising and up-to-date methods are employed in their respective towns, the desired end will be attained.

NEW RETORT-HOUSE AT THE BRUGES GAS-WORKS.

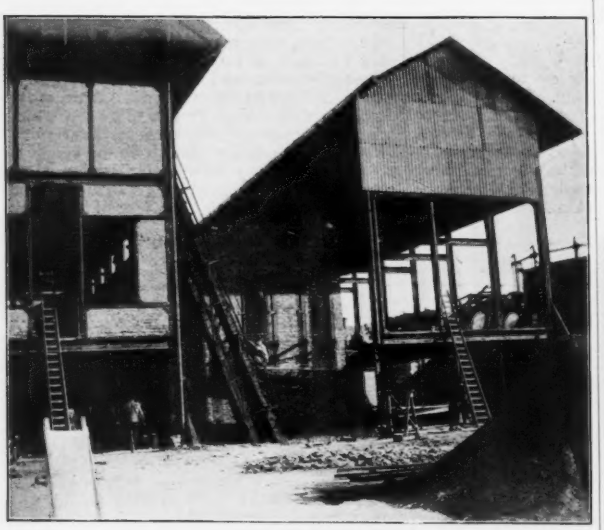
[COMMUNICATED.]

THE writer recently had the opportunity of visiting the gas-works at Bruges under the guidance of M. De Brouwer, whose inventions are so well known to "JOURNAL" readers.



No. 1.—General View of the Bruges Gas-Works.

The works are situated on the outskirts of this beautiful and famous old town on the banks of the canal connecting Ostend and Bruges; a railway siding adjoining the works is also available for the transport of coal, coke, and other material. The most interesting part of the works to be seen at the present time is the new retort-house now nearing completion. This house will contain six beds of eight through retorts, arranged in two vertical rows as shown in the photographs. The construction of the roof is entirely different from that usually adopted, and should be an innovation well worthy of reproduction in other retort-houses. The arrangement of the roof is shown in Photograph No. 2; and it may also be seen in the view of the works. It consists of two



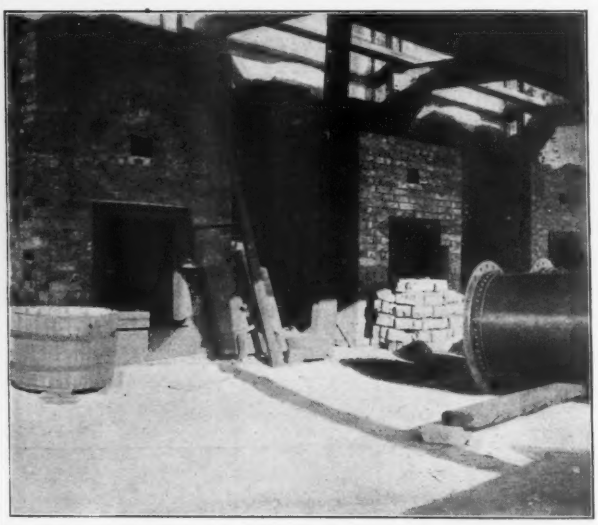
No. 2.—Retort-House Roofs under Construction.

light corrugated iron roofs—one covering the long coal-hopper and machine, the other the men working on the opposite side, where most of the work will be done; the furnaces (only one of which is used for each setting), the ascension pipes, hydraulic mains, and hot-coke conveyor all being situated on this side. The machine, as shown in Photo graph No. 6, is a combined De Brouwer charger and pusher, and has been designed with a view to its being worked by one man.

The buckstays are u sed to support one side of each roof—a plan lately adopted in one or two new retort-houses. The roof covering the hopper (which is sufficiently large to hold 36 hours consumption of coal) is also enclosed on its three sides by 4½-inch brickwork supported by a steel framework. Photograph No. 2 shows the elevator to be used for raising the coal from the ground level into the hopper, over which will be placed a push-plate conveyor for distributing the coal along its entire length. The whole arrangement of the roof has been designed with a view to the provision of proper ventilation and the improvement of the conditions under which retort-houses are usually worked. The covering will be adequate; and it cannot but result in increased and improved work on the part of the men. It follows out the usual coke-oven practice of leaving the ovens uncovered. So long as the bench is sufficiently protected against cold winds by thickness of brickwork; and as it is provided with a drain to carry off rain water, it is difficult to conceive any reason why this type of retort-house covering should not be successful. In any case, it must certainly constitute a considerable saving in initial outlay.

Provision has been made for expansion of the settings in the following manner: On the opposite side to the coal-hopper, the stage is supported on cross joists resting on, but not attached to, brackets bolted on the buckstays. The joists are kept in position by a pair of angle brackets attached to the buckstays. In the web of the cross joists a slot some inches in length has been cut corresponding to a similar slot in each of the angle brackets. The joists rest on the underneath brackets some inches from the buckstays, so that the slots will allow of any expansion or contraction. This arrangement is shown in Photograph No. 3.

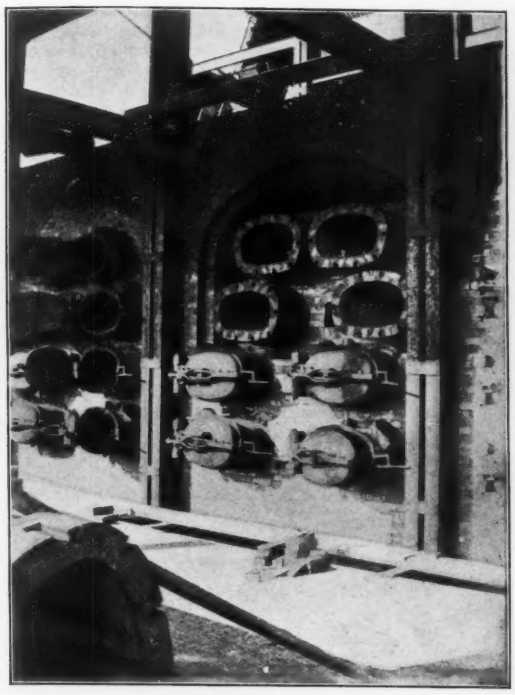
Each setting is heated by one regenerative furnace. It has also a separate chimney—the vertical flue conveying the waste gases being built in the parting walls. These chimneys had not been built at the time the photographs were taken. M. De Brouwer's long experience in the discharging of retorts by pushers convinces him that the shape of the retort plays an important part in the success with which the coke may be discharged. Photograph No. 4 shows that preference is given to a ⌂ retort of an unusual shape. It is very wide, but of about the usual



No. 3.—View under the Staging.

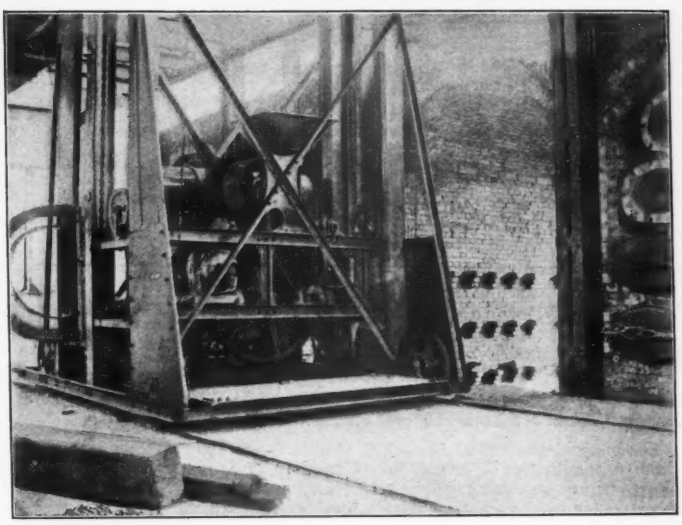
height. The sides taper inwards from a point near the top, finishing off with a sharp radius at the bottom. M. De Brouwer holds the opinion that the tapering of the sides allows of a slight lifting of the coke at the moment when the pressure of the ram is exerted upon it, and so very naturally greatly assists in its easy removal. The writer has heard of cases where a coke-pusher fitted with a powerful ram, operated under a high working pressure, has only been partially successful. It is quite possible, though it was not thought of at the time, that the shape of the retorts was an influencing factor in the non-success of the machine.

Mention has already been made of the fact that the settings are provided with single ascension pipes, the size of which appeared



No. 4.—Section of Retort specially adapted for Coke-Pushers.

No. 5.—The Retort-Bench in Course of Construction.



No. 6.—Combined De Brouwer Charger and Pusher for the New Retort-House at Bruges.

to be about 8 inches. The position of the hydraulic mains may be seen in Photograph No. 5. The bridge-pipe connecting the ascension pipes and the hydraulic is of quite a novel design. It consists of a long built-up wrought-iron box, oval in shape, about 1 foot 6 inches high by 8 inches wide. Each end is fitted with a blank flange for cleaning purposes. Over the ascension pipes and the hydraulic is also placed a cleaning hole. The object of this arrangement is to give ample area for the gas to pass without resistance from the retort to the hydraulic main. It is further so arranged that any bridge-box may be easily and quickly disconnected and another fixed in its place. The choked box may then be cleaned out at leisure.

It is well known that the bulk of the wear and tear (an item which is, it should be pointed out, an excessively small one) on the De Brouwer charger is due to the comparatively short lifetime of the belt. It was noticed that "balata" belting, strengthened by rows of copper rivets, was being used at Bruges, and, the writer was informed, with considerable success.

The men's comfort was not forgotten in the building of this retort-house; for under the staging on one side of the house was to be seen a roomy lobby fitted with baths and basins.

The works are well equipped with an excellent electrical plant; the prime motive power being gas-engines. The new retort-house, like the old one, will be operated entirely by electricity. The coke plant is also driven by an electric motor; while the coke is further stacked by electrical power. The exhausters are, however, belt-driven from a gas-engine. The control of the district pressure is simplified by an arrangement of quite a novel character. An ingenious electrical device sounds a bell in the engine-room at the works whenever the pressure at the farthest end of the town rises above, or falls below, a certain predetermined point. The writer can vouch to its efficiency, for it was tested in his presence. The price of gas is equivalent to our 3s. 6d. per 1000 cubic feet, and would be a good deal lower were it not for the excessively low price at which gas for street lighting must be supplied.

The writer would like to add how much he appreciated the courtesy with which he was received, and the readiness with which he was shown everything of interest.

A GAS COMPANY'S FIRE EQUIPMENT.

In the "Journal" for the 28th of April, we gave some particulars in regard to the Emergency Department maintained by the Consolidated Gas Company, of New York City. We have since received an interesting account, accompanied by some well-executed photographs, of the fire equipment which has just been completed for the Los Angeles Gas and Electric Company; and we give the following details as furnishing an indication of the extent of the measures taken by the Company in question to deal with mishaps or fires, or to remedy defects in their system.

It is stated that the Company are the first in America to employ an automobile, fully equipped, for rapid fire-emergency service. It is a 30-H.P. "Rambler" touring car, of which the carriage portion has been removed, and a special compartment built in its place which carries all the necessary appliances for dealing with fire. The appearance of the automobile as transformed is shown in the photographic reproduction given on p. 36. It stands constantly in the rear of the Company's principal office, which is a by no means unimposing building. The crew consists of eight men, who have been specially drilled for the work required of them; and they are equally divided between day and night duty. Being painted a bright red, the car is strikingly attractive. There is room for one man on the seat beside the driver, two more can ride on the foot-board, and if necessary two or three others on the box. On the car are painted the words: "Los Angeles Gas and Electric Company, Emergency No. 1."

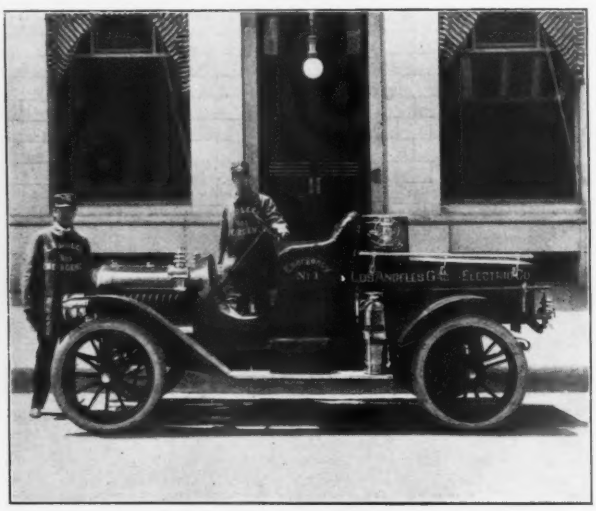
As will be seen, the front of the car is like an ordinary passenger automobile; but in place of a tonneau there is a large oblong body, enclosed like a box, in which is arranged for immediate use the emergency equipment, consisting of picks, shovels, hammers, monkey wrenches, chisels, rubber gloves, electric searchlights, handsaws, screwdrivers, caulking-irons, safety helmets, a kit of medicines, bandages for first aid to the injured—in fact, every tool and appliance that could possibly be needed to meet any emergency that might arise. A special feature is a tank of oxygen which will be of service in case of men who are near asphyxiation. The tank is carried on the side of the car, and has a small hose attached. The car is also equipped with a small chemical fire extinguisher.

Immediately upon communication being received regarding a leak, for instance, the emergency crew are called into action, and by the time the telephone operator has secured the details regarding the trouble, the automobile is cranked and ready to start. As the machine is equipped with a 10-inch fire-gong, and has the

same right of way in the street as a fire-engine, the length of time required to reach the consumer is reduced to a minimum. Arriving at the site of trouble, the foreman locates the party telephoning the complaint, and ascertains the cause. If it is from leaky fittings or appliances or defective inside wiring, the necessary remedy is quickly applied, and the crew return to the station, first ascertaining over the telephone if any more orders have been received for them. If the trouble is found to be in the street-main or service-pipe, the driver of the car, who is furnished with a book containing names of the Company's employees, quickly collects additional help from among those residing in the vicinity.

The emergency crew are instructed to respond to fire-calls; a fire alarm bell being in service at the crew's station. The quick arrival at fires of trained gas and electric men will be of great assistance to the Fire Department of the city in looking after live wires and gas-pipes in burning buildings.

The Los Angeles Gas Company's Offices.



The Emergency Staff with their Car.

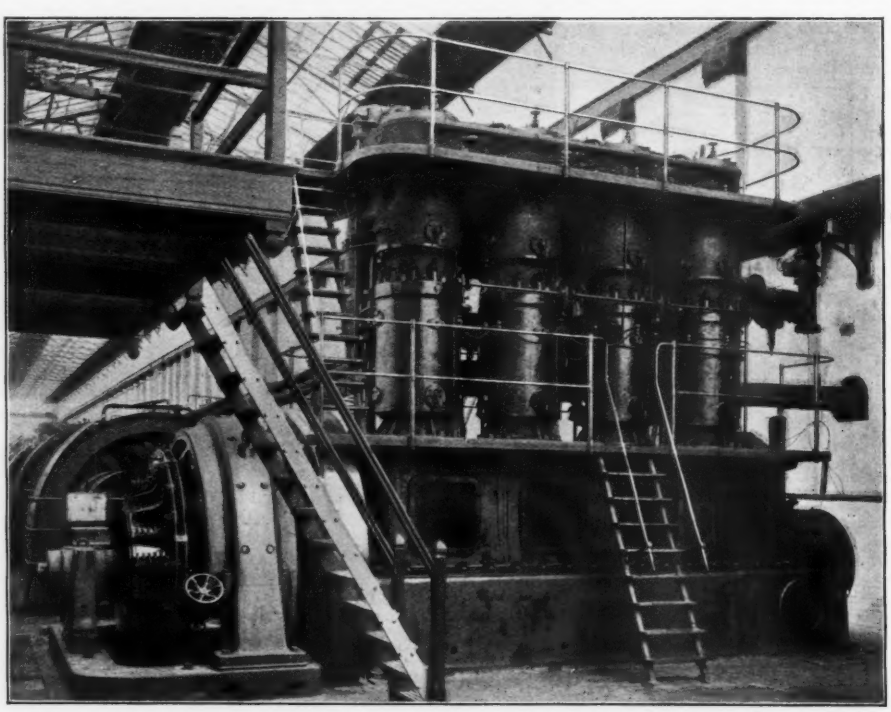
LARGEST VERTICAL GAS-ENGINE IN THE WORLD.

An event of more than usual importance took place on the 6th ult., at the works of the Castner-Kellner Alkali Company, Ltd., Runcorn, when a 1000-B.H.P. gas-engine was started-up.

The engine, which is of the latest standard vertical type, supplied by the British Westinghouse Company, is connected to a direct-current generator supplied by the same makers. It forms an extension to the existing installation at Runcorn, where four 759-B.H.P. engines of the same type have been in operation for some time in connection with the firm's electrolytic process.

Some idea of the 1000-B.H.P. engine may be gained from the accompanying illustration. It will be noticed that the cylinders, in pairs, are placed over four cranks, by which arrangement the makers claim that they can give the most even turning moment of any gas-engine on the market. No water-cooling is used for the pistons, valves, or other moving parts—thus avoiding any danger of breakage of pistons, which is often a source of trouble in connection with large horizontal engines. Forced lubrication is used throughout. The oil-pumps are in duplicate; and these can be examined and the oil-sieves changed while the engine is in operation. All valves are positively operated by means of straight push-rods actuated direct from the cam shaft. They are also arranged with adjustable screws, so that any play or wear on the valves can be taken-up while the engine is in operation.

In addition to the five Westinghouse engines of this type now



A Westinghouse 1000-B.H.P. Gas-Engine at the Runcorn Alkali Works.

installed at the Castner-Kellner works, three of 750-B.H.P. capacity have been supplied to Messrs. Pilkington Bros., of St. Helens, for their glass-works; one of 750-B.H.P. to the Hollins Mill Company, of Marple, which has been working for some considerable time operating their cotton mill; and visitors to the Franco-British Exhibition will have noticed one of these large engines in the right-hand corner of the Machinery Hall. This engine runs in conjunction with a Parsons turbine, and supplies electric current to the Machinery Hall.

THE AUTOMATIC DETERMINATION OF CARBON DIOXIDE.

In the "JOURNAL" for the 16th ult., brief reference was made to a paper submitted by Dr. Charles A. Keane and Dr. Harry Burrows to the members of the London Section of the Society of Chemical Industry at their meeting held on the 1st ult. The following is the full text of the paper, with notes of the discussion upon it, as published in the Society's "Journal."

The importance and economic value of the fullest possible control of the combustion of fuel has led within recent years to the construction of a variety of forms of apparatus for the automatic analysis of furnace gases. To obtain a reliable criterion of the course of a combustion, it is well known that so-called "average samples," even when a constant method of suction is used for drawing the sample, are unsatisfactory, as variations in composition that may occur during the period of sampling are not detected. To gauge the effect of stoking or of any special method of combustion adopted, the only satisfactory plan of analysis is to take a series of separate samples at successive short intervals. The work thus involved is considerable, and the advantages offered by any form of automatic apparatus for this purpose as a labour-saving appliance needs no comment. The chief essentials for such apparatus are a sufficient degree of accuracy for technical work, responsiveness to variations in composition of the gases examined, and applicability to use in works.

The forms of apparatus hitherto introduced for the automatic analysis of furnace gases are based upon the determination of the contained carbon dioxide. They may be divided into those in which the determination is effected by means of the specific gravity of the gases, and those in which the contained carbon dioxide is removed by absorption. The former include the Lux gas-balance, Arndts's "Oekonometer," and similar apparatus devised by Pfeiffer, Siegert, and Krell. Since the specific gravity of furnace gases is not only dependent upon the proportion of carbon dioxide present, but also upon that of the contained water vapour and unburnt gases, and is, moreover, variable with the pressure, results based upon this method of determination can only be regarded as approximate, and are not sufficiently accurate or reliable to substitute for the ordinary analytical methods.

The forms of apparatus in which the carbon dioxide is absorbed are more reliable, as their method of working is based upon the removal of the specific constituent of which the percentage is required to be known. The forms of apparatus based upon this principle include the "Ados" or "Sarco" apparatus, the Simmance and Abady "Combustion Recorder,"* the apparatus of C. Jung, those of Mr. H. J. Westover and Mr. W. H. Porter, the Uehling-Steinbardt "Gas Composimeter," and the "Autolysator" of Strache, Johoda, and Genzken.

Of these, the "Ados" and the Simmance-Abady combustion recorder are the best known in this country. Both depend upon the absorption of the carbon dioxide by means of a solution of potassium hydroxide, and subsequent recording of the decrease in volume resulting from the absorption, whereby an intermittent estimation of the carbon dioxide in the furnace gases is caused at successive short intervals. In the "Autolysator" the absorption is effected by means of soda-lime, and the pressure of the gas before and after the absorption is measured by differential manometers. A continuous record of the proportion of carbon dioxide is thus obtained. This difference in the principle adopted introduces some advantages; and as the apparatus is not yet much known here, a description of its construction and of our experience with it may be of interest.

Description of the Autolysator.—The gas to be analyzed is drawn by water suction of constant pressure through two similar capillary tubes, each of which is connected with a manometer. A constant flow of gas is thus obtained through the two tubes; and provided no absorbent be interposed, the two manometer readings will necessarily be the same. By interposing an absorbent, however, between the two capillaries, a means is introduced for determining the presence of an absorbable gas by virtue of the difference in pressure that will arise and be indicated on the manometer, provided the flow of gas be so regulated that a constant volume passes through the apparatus.

For the practical carrying out of this comparison, the apparatus is arranged in the manner shown in fig. 1.

K_1 and K_2 are capillary tubes of glass, of identical bore and length; the former being connected with manometer M_1, and the latter with manometer M_2. The absorption vessels A_1 and A_2

* See "JOURNAL," Vol. XCIX., p. 773.

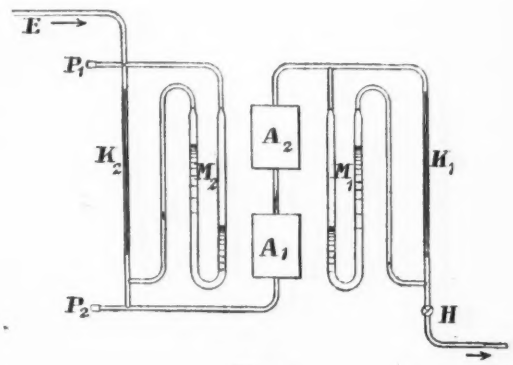


Fig. 1.

are interposed, as shown, between the capillary tubes. The volume of gas passing through these tubes is regulated by means of an adjustable regulator at H, shown in more detail at R (fig. 2). This consists of a cast-iron box, provided inside with a bellows made of thin flexible metal. The bellows is in communication internally with the gas after absorption, and is attached to a small solid cone J, provided with a universal joint which works in a seal that controls the outlet of the gas to the pump. By means of an adjustable screw B, the bellows can be raised or lowered, and the aperture for the exit of the gas thus regulated. The rate of flow of the exit gases after absorption is therefore fully under control. Thus regulated, the gas is drawn through the apparatus by means of a constant-level water-pump P.

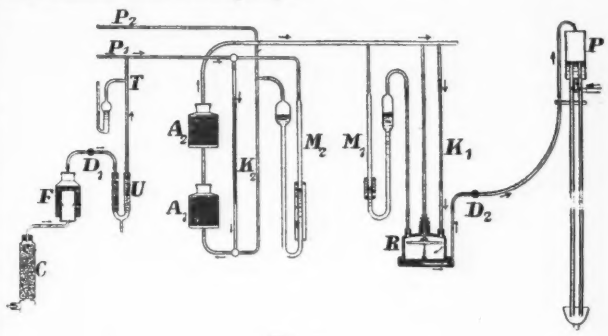


Fig. 2.

The gas to be analyzed is drawn in at E (fig. 1) through the capillary K_2, and the pressure recorded on the attached manometer M_2. If no absorbable gas be present, the position of this manometer is recorded as the zero of the attached scale; the manometric difference being solely determined by the difference of pressure of the gas before and after passing through the capillary tube. This condition is then exactly identical with that recorded in the manometer M_1, and both will stand at the zero point together, as the same volume of gas is drawn through both capillaries in a unit of time. In presence of an absorbable constituent—*e.g.*, carbon dioxide—which is subsequently removed, a difference of pressure will be recorded in M_2 dependent upon the quantity of gas removed, as this is determined by the relative volumes of gas which pass through the two capillaries in a unit of time. If, therefore, an absorbable constituent be removed before the gas enters K_1, a proportionally greater quantity of gas must be drawn through the capillary K_2 in a unit of time, as the flow through K_1 is always constant. This difference is recorded on the scale of K_2, and thus gives the percentage of carbon dioxide in the gas. After leaving K_2, the gas passes into the absorbing vessels A_1 and A_2, which are charged with soda-lime, and is there freed from carbon dioxide. From A_2 the gas passes through the capillary K_1 and the regulator R to the pump P.

Further details of the apparatus are shown in fig. 2. C is a drying-tower loosely packed with coke and calcium chloride; F is a filter-box filled with glass powder, and fitted with a perforated glass cylinder so as to break up the current of gas as completely as possible in order to retain the last portions of dust and dirt. The gas then passes to the three-way tap D_1, which can be put into communication either with the gas supply or with the outside air. U is a drying-tube, one limb of which is filled with glass wool, and the other with coarse calcium chloride. A safety-tube is attached at F. The tap D_2 is a three-way tap which can be opened either to the outside air or to the apparatus, so that the communication with the pump is readily made or broken. The tubes P_1 and P_2 are in circuit with the manometer M_2, and lead to a recorder (fig. 3) on which the readings of M_2 are continuously registered.

The recording is dependent upon the movement of the float *w*, which is free to move up and down in the cylinder O. This opens into a metal box G, which is partly filled with water to the required level. To the upper end of the float a pen *f* is attached, to record on the revolving drum *x*, and the whole is enclosed in a bell-jar provided with a mercury seal. P_1 (fig. 2) communicates

with tube 20 (see fig. 3), so that the pressure on the water in G is the same as that of the gas before passing through the capillary tube. P_3 communicates with tube 19; and thus the pressure in the bell-jar is equal to that of the gas after passing through the

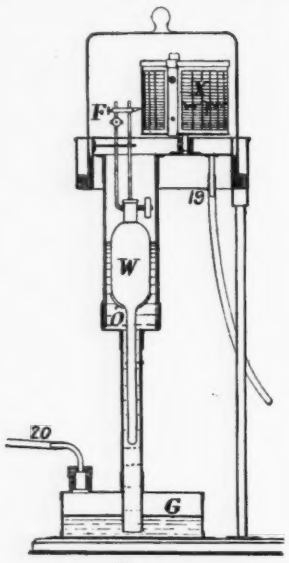


Fig. 3.

capillary tube. The manometric difference in M_3 is thus reproduced on either side of the float w; and by this means a continuous record of the percentage of carbon dioxide is obtained on the drum.

To adjust the instrument for use, it is first necessary to bring both manometers to the zero point by drawing air through the apparatus. To effect this, D_2 is connected with the pump, the water turned on, and D_1 opened to the air. When the liquids have taken a constant position, the regulator R is adjusted so that the difference of level on each of the two manometers is about 25 centimetres, and the movable scales adjusted exactly to the zero on each. The apparatus is then ready to be attached to the gas supply, which is effected without disturbance by simply turning the tap D_1.

It is most important that the water pressure should be constant, as it was found that unless this condition is observed small variations in water pressure such as arise by the turning on or off of taps on the same supply made it impossible to obtain consistent readings. This is readily secured by supplying the water from a small tank provided with a ball-cock. A fall of 2 metres is required for drawing the sample of gas.

Experimental Results.—A series of tests were first made on a laboratory scale by drawing the products of combustion from a gas-furnace and comparing the records, at intervals, with actual gas volumetric determinations. The maximum error under these conditions in no instance exceeded 0·5 per cent., and with two exceptions was within 0·2 per cent., as is shown in the following results. The intervals between the several tests varied from half-an-hour to an hour-and-a-quarter:—

Duration of Test.	Recorded Percentage of Carbon Dioxide on the Autolysator.	Analytical Determination.
I.—2 hours	5·8	6·0
	6·0	6·0
	6·0	6·0
II.—2½ hours	5·5	6·0
	6·0	6·0
	6·5	6·8
	7·0	6·8
III.—6 hours	10·0	10·0
	10·0	10·2
	10·0	10·2
	10·4	10·6
	11·5	10·6

The records of the Autolysator are accordingly in satisfactory agreement with the analytical results. The apparatus responded most efficiently and rapidly to changes in the percentage of carbon dioxide in the gases, and the advantages of a continuous record were clearly indicated. To test whether the absorption was complete, the exit gases from the Autolysator were passed through a previously weighed soda-lime tube, when no increase in weight was observed.

The favourable conditions of a laboratory test for an apparatus of this character are, however, very different from those which obtain in works practice—such as the examination of the furnace gases from boilers, producer gas, &c., for which purpose the instrument is more especially designed. Through the kindness of Mr. Bailey, the Chief Engineer to the City of London Electric Lighting Company, and with the helpful co-operation of Mr. O. L. Peard and Mr. C. G. Cutbush, we have been able to make a series of tests with the furnace gases from the boilers at the central generating station of the Company, and thus to compare the preliminary indications of the applicability of the Autolysator, as shown by the laboratory tests, with the requirements of practical working. These tests were made on a hand-fed boiler, the samples drawn at the damper, and the apparatus placed at a distance of about 30 feet from the boiler.

As far as our tests have gone, no dirt or hydrocarbon vapours are carried into the capillary tubes, which would, of course, interfere with the records of the instrument. The chief difficulty we have encountered has been to maintain a sufficient and constant suction from the flues, so as to secure a true sample of the gas in the apparatus. With a water-pressure of 2 metres, the pull was found to be insufficient in most cases, working at the distance from the furnace to which we were restricted; and the variations in the draught of the furnace rendered the apparatus less reliable than under the laboratory conditions of work. To secure a more constant and reliable suction, the apparatus was coupled with an "Ados" apparatus—an arrangement which had the further advantage of contrasting the readings of the two instruments. Under these conditions, the curves shown in fig. 4 were obtained on which the variations in the percentage of carbon dioxide during the test and the duration of the experiment are recorded. The readings in both cases agreed with those obtained by the "Ados," which recorded at intervals of five minutes.

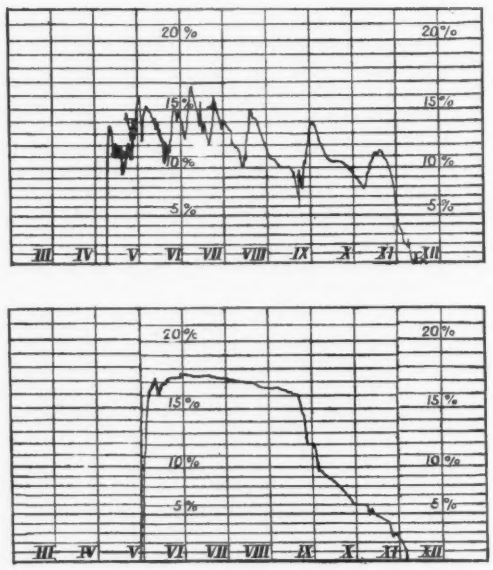


Fig. 4.

The satisfactory drawing of the sample for a continuous test where there is a varying and considerable draught to overcome is all-important; and the tests we have made up to the present indicate that some modification of the apparatus in this respect is desirable. We have tried increasing the water pressure in various ways, and are of the opinion that this difficulty will be best met by so arranging the suction that a branch of the sample, instead of the whole sample, is conveyed to the Autolysator—a plan which we now propose to adopt.

In this connection, the life of the soda-lime is also an important consideration. When the gases are drawn through at a rate of 20 litres per hour (the speed recommended for continuous tests), it is said to require renewal every 24 hours in the case of gases containing 10 per cent. of carbon dioxide. Our tests indicate a somewhat shorter period before saturation is reached. With gases containing 15 per cent. of carbon dioxide, and drawing 40 litres per hour, the absorption began to slacken after five to six hours. This is probably as much due to the formation of channels in the soda-lime as to its becoming saturated; but the incompleteness of the absorption after this period is certainly marked. If it be borne in mind that this corresponds to an absorption of about 24 litres of carbon dioxide, this limitation is not surprising.

From reports we have received from Messrs. Favre and Co., to whom we are indebted for the loan of the Autolysator, we can state that the satisfactory working of the apparatus has been established in the automatic determination of the carbon dioxide in producer gas employed for heating gas-retorts and in the manufacture of water gas.

Compared with other forms of automatic apparatus for the estimation of carbon dioxide, the continuity of the record and its marked responsiveness to changes in composition are distinctly advantageous; and its accuracy under favourable conditions of working should render it useful in several directions, apart from testing flue gases. For the latter purpose, the accumulation of further independent experience must establish its comparative

value with other forms of apparatus. The cost of the soda-lime and the conditions of its renewal will naturally be weighed against that of the potassium hydroxide solutions used in other apparatus, and which requires renewal only at considerably longer intervals. Also the cost of water used for the suction may be an economic factor of some importance.

The introduction of automatic analytical apparatus during the past few years marks a new and important advance in the methods for the control of the conditions of working in chemical industries. They have hitherto been concerned essentially as a guide and check on the efficiency of combustion of fuel and of its calorific value; and in this application they have undoubtedly proved efficacious, apart from what may be regarded as their moral influence on the stoker.

As yet automatic analysis is quite in its infancy, and the engineer rather than the chemist has hitherto been chiefly concerned with its use. It holds out the possibility, however, of important applications, both in many chemical industries and in methods of investigation to which it has not yet been adapted; and from this standpoint it merits the best attention of chemists. Our own inquiries have been initiated with the object of applying the method to the automatic testing of the composition of illuminating and heating gases by analysis of their products of combustion—a problem we have now under investigation, and on which we hope to report to the Society on a future occasion.

In opening the discussion on the paper, the Chairman (Dr. J. Lewkowitsch) remarked that the advantage of the apparatus shown would lie in the fact that it could be put into the boiler-house, so that the fireman could read the results himself. A serious objection was, however, that every four or five hours the soda-lime would have to be renewed. The assertion made by the makers of the apparatus that the soda-lime lasted a long time with producer gas had very limited value, as such gas contained only about 5½ per cent. of carbon dioxide; but even with this amount, difficulties would soon arise. It occurred to him that it might be possible to put in one or two more soda-lime boxes, and have a bye-pass, so that the boxes could be changed over as soon as the absorption began to fall off. He also inquired as to the cost of the apparatus.

Mr. G. N. Huntly said the apparatus marked a distinct advance, inasmuch as it gave an instantaneous determination of carbon dioxide; whereas the recording instruments in current use were semi-integrating, averaging the samples every five or ten minutes. Further simplifications seemed necessary for practical use in the boiler-house. The engineer wanted something to correspond with the pressure-gauge, with a definite working line for the stoker. The Autolysator, was a step in this direction, because it gave a column of liquid which the man could be told to keep at a certain height; but the apparatus seemed designed rather for a chemist than a stoker. The rapid saturation of the soda-lime was a very serious difficulty. No engineer would use an instrument which required attention every four or five hours.

Sir F. Nathan said he had for some time had an Ados recorder installed in his factory; but it did not give a continuous record. He was much struck with the simplicity of the Autolysator as compared with it.

Dr. R. Lessing asked if it had up to now been ascertained that the composition of the gas remained unaltered after its passage through the capillary tubes. He said that when taking water gas or producer gas from a gas-conduit, and drawing it with slight suction only through very narrow capillaries, the hydrogen might, through its smaller internal friction, pass more freely than the carbon monoxide and carbon dioxide. The proportion of hydrogen to carbon dioxide would then be increased, which would considerably affect the composition, and consequently the differential pressure, of the manometers.

Mr. W. C. Hancock remarked that the supplying of more or less continuous records tended not only to methods of economy but to better control in various manufacturing operations. In the case of flue gases, the mere record of carbon dioxide, as a check on the completeness of combustion, was not complete. An instrument was wanted which would give the other constituents. With regard to producer gas, there was a great opening for these instruments. The advantage of getting the percentage of carbon dioxide as a record of the way in which the producers were working was very great. Naturally, the quantity varied with different types of plant; but, as a general rule, it might be taken as a very fair guide as to the efficiency of a producer plant working under more or less established conditions. Recently he had been told that the Simmance-Abady instrument worked very satisfactorily, but that when used with producer gas the clogging of the tubes with tarry matter or fine dust caused difficulty; and some modification would be necessary before these instruments could be employed systematically in works.

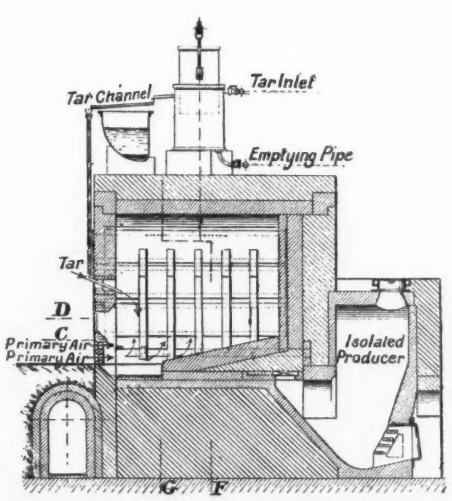
Dr. Burrows, in reply, said he thought the difficulties which had been referred to would be overcome after further experience with, and modification of, the apparatus, especially in regard to the analysis of gases rich in carbon dioxide. With reference to volume alterations of the gas caused by variations of temperature, this was controlled by the self-adjusting regulator; and since it was set to allow a definite volume of gas to pass through it in a unit of time, the only temperature effect would be upon the metal parts of the regulator, which would have to be considerable to affect the working. The viscosity of the liquid employed in the manometers could only affect the sensitiveness of the instrument; and the changes in the composition of the gas would have to be very rapid to cause any considerable error. In answer to the Chairman's question, Dr. Burrows stated that the cost of the apparatus was about £25.

HEATING REGENERATIVE FURNACES WITH TAR.

By M. Echinard.

[A Paper read before the Société Technique du Gaz.]

The greater part of the tar produced by gas-works is used by tar distillers for obtaining light oils, such as benzol and toluene; heavy oils, as phenol, naphthalene, and anthracene; and the residual, pitch. Benzol and toluene are the sources of the production of aniline and aniline dyes. The latter industry is becoming more and more monopolized by Germany, and the market for French colouring material more and more restricted. Pitch, which is used for the manufacture of compositions and asphaltes, as well as the heavy oils used for creosoting timber, are products which vary very much according to the demand and prosperity of allied industries; and at the present time such materials are falling in price. Road tarring will perhaps one day be more in favour than it is at present; and it is to be hoped that the Road Congress, which will be held towards the close of the year will lead to larger and increased demands for tar. But, in the meantime, we have to face the fact that for some time past the supply has greatly exceeded the demand; thus causing considerable reduction in price. Gas-works have, therefore, to endeavour to



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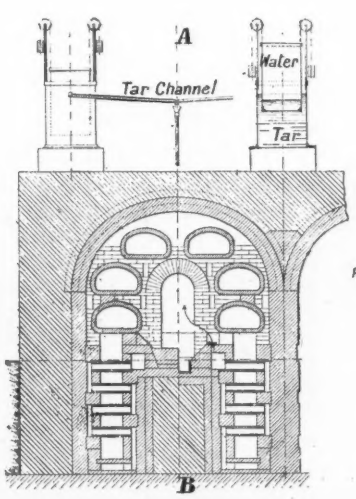
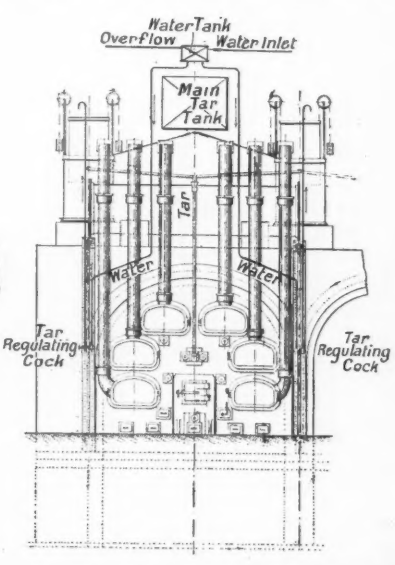
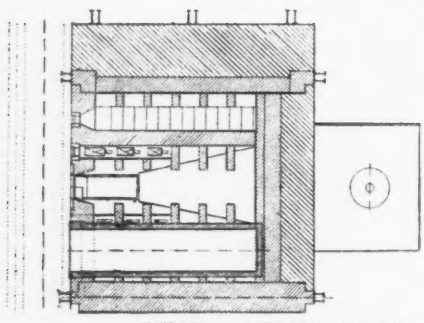


Elevation.



Elevation, showing the General Distribution of the Tar and Water.



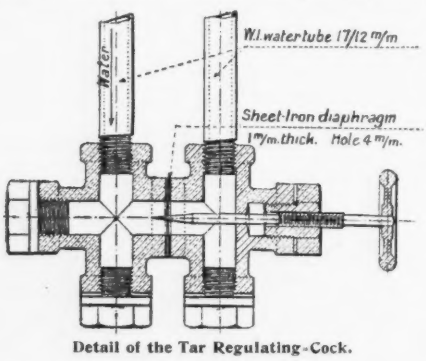
Half Plans on the Lines C and D.

use their stocks of tar themselves, as their contracts fall in and they find they cannot renew at remunerative prices. Day after day almost, it has been necessary to arrange for the burning of tar, and one or more retort-beds have, according to the size of the works, had to use tar for heating them. This paper describes the modifications made for this purpose to beds of eight retorts with producers and regenerators lately erected on the system of MM. P. de Lachomette et Cie.

Heating by tar is an exceedingly delicate operation. The temperature is very high at the point of combustion, and the tar flow is difficult to regulate. The problem consists in choosing the spot where to have the combustion, and to control the tar supply. If the tar is burnt in the producer, the latter is uselessly and excessively heated, but not the whole setting. We have not hesitated to carry the combustion into the bed itself, nor to do away with the two middle retorts, so as to have a sufficiently large combustion chamber, and avoid the blow-pipe like effects which in a short time would have destroyed the retort under which the tar is supplied. With the producer cut off, and the two middle retorts suppressed, we built up again the small walls carrying the retorts, and made in the façade of the bed a special arrangement for the introduction of the tar, and for the inspection and working of the bed. All the retort-beds so modified had already been in fire, and the first bed was ready to be reset. The iron mountings of the two retorts in question having been taken off, the retorts were demolished bit by bit. When the first wall supporting the retort was reached, its arch was quickly rebuilt, and so on with the second and other walls. About 40 centimetres (16 inches) of the retort were pulled down at each operation. All the gas outlets from the producer were stopped up. The three secondary air inlets at the back of the bed were done away with; but the first three at the front were kept. This would enable us either to work with the regenerators if we succeeded, and if it did not cause too high a temperature for the fire-clay material; or, on the other hand, to have means of introducing air into the setting to reduce the heat if we found it was too great. The three secondary air inlets could be stopped by bricks from the outside. Above the iron door with which the bed is provided—like that of a direct-fired furnace—is an opening between two sight-holes to allow for the placing of a channel or angle iron for the supply of the tar. A channel iron is to be preferred, for it can be cleaned more easily. A rectangular sight-hole placed below the front enables the residue of the combustion of the tar to be cleared away. Instead of the rectangular sight-hole, a damper can be used so as to allow of regulating perfectly the amount of primary air.

Feeding the Furnace.

Regulating the flow of the tar by means of a cock is rather difficult, owing to its slight fluidity and quickness with which it thickens. In the arrangement adopted, the tar flows freely in a large pipe from a tank to the furnace, and it does not meet with any restriction of section on its way. The displacement of the tar is effected by means of a second tank plunging into the first,



Detail of the Tar Regulating-Cock.

and from the former of which flows a stream of water, governed by a regulating tap controlled by the stoker. The water is taken from a small reservoir provided with a ball-cock. The flow of water regulates the flow of tar. The water-tank plunging into the tar-tank is balanced by two counterbalance weights on rollers. On the retort-bed and over each pier wall is a tar-tank, which is fed from the main tank.

The installation is not really complicated. While one tank is being emptied, the stoker has time to clean the second, if required, take out the thick tar, and grease the rollers. Then he puts the second tank ready to work immediately the first is empty. A regular supply of tar is thus assured. The tanks contain enough tar for about six hours' working. The quantity stored is always the same, and the amount used as fuel is easily calculated. With a bed arranged and equipped as described, we have carbonized 140 kilos. (2 cwt. 3 qrs.) of Champagnac coal—though difficult to distil—per retort in four hours. The consumption of tar varied between 10 and 14 per cent. For more than a month it has not exceeded 11·34 per cent. of the coal carbonized. This was while the tar-bed was part of the whole bench under fire. When it was working by itself, the fuel percentage was higher.

Again, to burn more easily the tar residue formed, the furnace can be provided with a closed grill of fire-bars. The advantage is not great, as only one hectolitre of residue is taken from the tar in twenty-four hours instead of two hectolitres. The grill is rather costly, and is soon worn out. Moreover, to burn this residue, much more primary air has to be used, reducing thereby the amount of secondary air, which thus causes a diminution in the temperature of the bed and much less economical working. By a judicious regulation of the primary and secondary air, we have succeeded in burning tar without producing any smoke at the chimney.

The first bed, before transforming it, had already been in service for 815 days. The small walls that we rebuilt in the bed have undoubtedly rather strengthened the retorts, which were more or less cracked; but it is of interest to note that working with tar, especially before the regulation of the bed was complete, has stopped up the cracks and covered them with a kind of black glaze.

The following is the cost of altering two Lachomette regenerative beds into tar beds:—

	Establishment Expenses. Frs.	Transformation Expenses. Frs.
Dismounting mouthpieces, ascension pipes, demolition of retorts, cleaning	—	35·00
Erection, labour	—	50·00
Material	—	230·10
Piping and cocks	200·55	—
Main tar-tank	80·00	—
Pier for same	73·70	—
Foundations for three tanks	10·45	—
Three tanks	435·00	—
Erecting same	72·70	—
Two iron furnace doors	110·10	—
Totals	982·50	315·10

Therefore, with an outlay once made of 982·50 frs. *plus* 315·10 frs. (say £39 6s. and £12 12s. 9d. respectively), or 1297·60 frs. in all (£51 18s. 9d.), two beds, of six retorts each, for burning tar can be built; and ultimately two other beds can be transformed for an expense not exceeding 350 frs. (£12).

This simple and cheap modification of regenerative beds of retorts enables tar to be burnt with advantage while its price is not higher than that of coke; and it also allows of returning to coke fuel without much expense, when the day comes that it will be beneficial to sell the tar.

In opening the discussion upon the paper, the President (M. Coze) remarked that just now, when the price of tar was extremely low, M. Echinard's communication possessed special interest. M. Delahaye asked the author what kind of tar was employed; and he replied that it was tar taken from the well, and was two or three months old. M. Mallett observed that, as the price of coal went up, that of tar would come down in proportion, as the production would increase. Consequently, managers would find themselves face to face with large stocks of tar, which would adversely affect its price on the market. This fact made M. Echinard's paper very interesting. He suggested that the subject should be dealt with in a paper, or be put down for discussion, at the next congress; and the President acquiesced in the suggestion.

USE OF AMMONIACAL LIQUORS IN SMALL GAS-WORKS.

By M. Guillet.

[A Paper read before the Société Technique du Gaz.]

The distillation of the ammoniacal liquors of small gas-works not having become at all general, it may be useful to inquire into the conditions under which such liquors can be sold direct or converted into liquors of greater concentration which can be readily transported. In some few cases, the raw liquor may be sold for agricultural purposes; but there is the grave objection that the ammonia is for the most part in a volatile state, and is readily lost by exposure to the air. The proportion remaining in the soil is but small; and, as a result, the liquor can only be

disposed of by giving it away or even by paying a small sum for its removal.

A better state of things might be expected if the ammonia were fixed in solution by saturation with sulphuric acid. The land would then get the benefit of its manurial value, and the sale among agriculturists on the basis of its percentage of nitrogen should then be possible. Liquors, however, obtained by simple saturation in this way are too weak for distribution except within a radius of a few kilometres. Assuming that one tonne of coal on distillation gives 80 litres of water, and that a further 20 litres are used for the washing of the gas produced; also that the same quantity of coal produces 2 kilos. of ammonia (which, let it be assumed, is totally dissolved in the water), we thus obtain a liquor containing 20 gms. of ammonia per litre, or 20 kilos. per cubic metre.

Assuming that the ammonia is fixed by sulphuric acid, about 80 kilos. of sulphate are obtained per cubic metre. If this be sold at a price of, say, 15 frs. per 100 kilos., 12 frs. per cubic metre will be obtained; and as expenses to the amount of about 9·60 frs. have been incurred for acid (equivalent to about 12 frs. per 100 kilos.), there remain 2·40 frs. as the net value of the cubic metre containing 20 kilos. of ammona—say, 0·12 fr. per kilo. of ammonia. In view of the cost of repairs, maintenance, &c., it will be seen that the cost of transport by the French railways does not permit of such a liquor being sent the distance of 25 kilometres, even without reckoning the expense of cartage at each end of the journey.

It must be noted that an ammoniacal liquor which has been neutralized and cooled can still dissolve ammonia to much the same extent as ordinary water. There is thus an advantage to be gained by dispensing with the 20 litres of water for the washing of the gas; this being replaced by the liquor already neutralized by the sulphuric acid. A liquor is obtained containing 25 grammes of ammonia per litre—say, 100 kilos. of sulphate per cubic metre; and valuing it at the price already mentioned, of 15 frs. per cubic metre, it will be found, after allowing for the cost of neutralization, that the price amounts to 0·12 fr.—a figure which does not allow of the distribution of the liquor by railway.

Adopting the washing of the gas by ammoniacal liquor previously neutralized with the sulphuric acid, a further step can be taken in this direction, and the water (employed for washing) after each passage through the washer also neutralized, so as to obtain in this latter apparatus a solution which is more and more rich in sulphate, and may even become a cold saturated solution. Several similar processes along this line were proposed years ago.

In these different processes, sulphuric acid has been used in the manufacture, in order to fix the ammonia; but the acid can give rise to trouble, since it has been stated (although the fact must cause some surprise) that meters and other parts of the distribution system have been attacked as a result of its use, while the neutralization of the ammoniacal liquor separately from the course followed by the gas has not been attended with these drawbacks when the liquor thus obtained was afterwards used in the washer. Dependence is also placed on water for the purification of the gas from part of its carbonic acid and sulphuretted hydrogen, which cannot be done if sulphuric acid is used in the washer. Nevertheless, the use of slightly acid water possesses some considerable interest; and it may be worth while to consider the experiments of Croll as regards the use of a tower filled with supporting plates and shavings, constructed of hard wood, and fitted with a purifying chamber supplied with chalk, and intended to free the gas from all traces of acidity while causing the repeated circulation of the same acidulated water. Complete removal of the ammonia is thus obtained independently of the outside temperature—a fact which gives the process importance for works situated in a warm country.

The tabulated results were obtained with coals of different kinds. The free ammonia is that evolved on boiling alone; the "combined" is that produced on subsequently boiling with caustic soda. The figures represent grammes per litre.

It will thus be seen that the fixed ammonia salts are retained chiefly in the hydraulic main. We see in the case of A a non-sprinkled main at the temperature of 60° giving a liquor in which 97 per cent. of the ammonia is present as combined or fixed salts. In the same works, another sample, taken under the same conditions, shows 87·5 per cent. of ammonia as fixed salts. In the case of B, the proportion falls to 50 per cent. in consequence of the sprinkling with ammonia liquor, which dissolves the fixed salts formed. In works C, although the quantity of ammonia is very considerable, the proportion of free ammonia is found to be rising, owing to the low temperature of the hydraulic main and the large proportion of ammonia in the English coal. Lastly, works D also show a proportion of 50 per cent. of fixed ammonia in the main, despite a considerable sprinkling with water. In addition to instances of works in which use is made of ammonia, passing attention should be given to one in which the only care bestowed on the process is to wash the gas in order to eliminate as much ammonia as possible without seeking to utilize it, owing to the want of proper apparatus.

None of these liquors are utilizable, except, perhaps, that from the condenser; but the small quantity of the latter removes it from consideration. In the case of a hydraulic main kept at a temperature of about 16°, and traversed by the hot gas coming from the retorts, the main forms a kind of primitive distilling apparatus into which it will be possible to pass cold ammoniacal liquor comparatively rich in free ammonia, which will be driven

WORKS A.—*French Coals.*

—	Degrees Beaumé.	Total Ammonia.	Free Ammonia.	Combined Ammonia.	Notes.
Hydraulic main .	1·5	8·79	0·27	8·52	Main not sprinkled. Temp. 60°.
Condenser. . .	1·3	10·89	10·58	0·31	Outside temperature, 12°.
Washer . . .	4·2	28 48	28·48	0·00	Temp. of water at outlet of "Standard" washer, 11°.

WORKS B.—*French and German Coals.*

Hydraulic main .	0·6	4·89	2·52	2·37	Main sprinkled with ammoniacal liquor to extent of 75 litres per metric ton in 24 hours. Temp. 58°.
Condenser. . .	1·8	9·94	8·50	1·44	Temp. about 13°. Temp. of water at outlet, 32°.

WORKS C.—*English Coals.*

Hydraulic main .	1·6	12 88	9·39	3·49	Watered with ammoniacal liquor from tank to the extent of 250 litres per ton in 24 hours. Protected against evaporation by plate and brick wall. Temp. 36°.
Condenser . .	11·0	77·94	74·13	3·81	Outside temp. 18°.
Pipe No. 1 . .	2·4	17·07	13·94	3 13	Filled with wood faggots, watered with 300 litres (per ton in 24 hours) of liquor from No. 2.
Pipe No. 2 . .	0·2	3·50	3·16	0·34	Watered with 300 litres of pure water per ton.

WORKS D.—*French and English Coals.*

Hydraulic main .	0·5	3·56	1·58	1·98	Watered with stream of pure water. Temp. 70°.
Condenser . .	5·9	46·01	45·20	0·81	Circulation Broussevaal condenser. Temp. of water spray 16°.
Coke col. No. 1 .	3·4	24·5	21·56	2·94	Watered with 25 litres per ton of ammoniacal liquor of 1·8° strength.

WORKS E.—*English Coals.*

—		Degrees Beaumé.	Total Ammonia.	Free Ammonia.	Combined Ammonia.	Notes.
Hydraulic main sprinkled with pure water; 200 litres per tonne per 24 hours.	No. 1	0·4	3·45	2·27	1·18	Two retorts charged. Temp. 36°.
	No. 2	0·4	4·05	2 67	1·38	Seven retorts charged. Temp. 55°.
	No. 3	0·4	4·09	2·62	1·47	4½ hours after charging. Temp. at end of distillation, 39°
Condenser		1·4	9·89	8·70	1·19	Surrounding temp. 16°.
Washer		0·3	2·50	2·22	0·28	Flint tower. Temp. 11°.

off and carried away by the gas into the cooling and washing apparatus. Two experiments were made with liquors of different concentration, and in such quantity as to represent the passage of all the liquor produced through the main.

In the first experiment, there are obtained from the hydraulic main in the ammoniacal liquors 554 grammes of ammonia per tonne distilled; but the wash liquors have only collected 1·071 grammes. In the second experiment, 607 grammes were obtained in the main while only 2·344 grammes were deposited in the wash liquors. If a production of 1600 grammes of ammonia per tonne distilled is assumed, which is very near to the truth in this particular case, it is seen that the proportion retained in the hydraulic main is practically constant.

	I.	II.
Total ammonia extracted by hydraulic main per metric ton distilled. . .	2·671 grammes	3·944 grammes
Ammonia extracted by water coming from the hydraulic main	554 ,,	607 ,,
Ratio of this latter portion of ammonia to total ammonia	44 p. ct.	27 p. ct.

Experiment No. 1.

—	Degrees Beaumé.	Total Ammonia.	Free Ammonia.	Combined Ammonia.	Notes.
Hydraulic main before experiment . . .	1·5°	8·79	0·27	8·52	Main not watered. Temp. 60°.
Liquor used for sprinkling . .	1·8°	13·39	12·39	1·00	Drawn from cistern.
Liquor after passing into the hydraulic main	0·7°	6·93	3·89	3·04	80 litres used per tonne. Temp. 60°. Sample taken after 48 hours' running.

Experiment No. 2.

Hydraulic main before experiment (deg.) .	1·5°	10·39	1·29	9·10	Main not watered. Temp. 62°.
Liquor used for sprinkling . .	4·4°	29·30	29·28	0·02	From washer.
Liquor after passing into main .	0·8°	7·59	5·54	2·05	80 litres used per tonne. Temp. 58°. Sample taken after 48 hours' running.

It should be noted that a works which might be arranged in order to provide for the reflow of all the liquors back to the hydraulic main would not need to provide for the passage of 80 litres per tonne, since it could subtract from this quantity the volume which condenses immediately in the main. The figures above given concerning the ammonia retained in the main are certainly the maximum.

We can conclude from the preceding that a hydraulic main which is properly arranged should be cooled not so much directly by the outside air as by the return of the condensed liquors, ammonia, and tar, the effect of which will be the more favourable upon the action of the main the greater the distance from which the liquors return. A greater fluidity of the tars will thus be obtained at the outlet at the same time as the retaining as vapour in the gas such products as benzol and ammonia. The condensations in the mains, &c., should thus return towards the hydraulic main—in other words, the gas and the products which condense from it should follow the same course, but in opposite directions. Even in modern installations it is often the inverse of this condition which is realized, apparently without the least importance being attached to the fact. The result in practice is the obstruction of the hydraulic main, which can be cleared only by the use of water out of all proportion. The return of the condensed products provides an automatic sprinkling without any apparatus, labour, or loss of ammonia; and if it were possible to overlook the difficulties of construction, the above principle might be embodied in a diagram which could be taken as a model for construction purposes—the hydraulic main being at the low point of the system, while the highest point would be represented by the Pelouze or other tar remover, and no outlet for the condensed products being provided between these two points.

This return of the condensed products is still more desirable in a small works when it is wished to remove or utilize the ammonia. As already pointed out, there are two kinds of raw ammoniacal liquors to consider—those drawn from the main and containing 20 to 30 kilos. of sulphate per cubic metre (if the temperature of the main is about 60°), and those produced in the washer, the strength of which latter can be increased by successive neutralizations. The manner in which the washing of the gas takes place with a solution successively strengthened in sulphate has been studied by the aid of a "Standard" washer. Pure water was used at the start, on its outlet from the washer, was almost neutralized by the sulphuric acid, and then employed again after cooling and aëration. This solution became stronger at each discharge through the apparatus, without ceasing to take up ammonia, as proved by the following figures:

Degrees Beaumé of Liquor at Inlet to Washer.	Sulphate. Grammes per Litre.		Free Ammonia at Outlet. Grammes per Litre.	Temperature of Liquid at Outlet. Degrees.
18 ..	260	..	13·55	.. 21
21 ..	318	..	15·92	.. 22
23 ..	364	..	15·50	.. 22
25 ..	420	..	17·80	.. 19
26 ..	448	compartment No. 1	4·40	.. 18
		,, ,, 4	10·50	
		,, ,, 7	15·90	

It will be noticed that, during the saturation, though the action of the washing of the solution has been continuous, as proved by the proportion of free ammonia at the outlet of the washer, there is evidently a greater and greater difficulty in increasing the strength of the liquid—a feature of the process which is due to the fact that in proportion as the sulphate increases in the liquid the solvent power of the latter for ammonia decreases. Allowance can be made for this by taking off a stream of gas from a point before the washer, dividing it into two equal streams passing, in the same time and at the same temperature, into two washers of the same form holding the same volume, one of pure water, the other of a completely saturated solution of sulphate of ammonia (532 grammes per litre). At the end of a certain time, the pure water contained per litre 18·5 grammes of free ammonia, while the saturated solution of sulphate contained only 5·2 grammes. In practice, the limit of usefulness of a sulphate solution is exceeded at about 20° Beaumé, corresponding to 300 grammes of sulphate per litre.

Where agricultural undertakings are in the neighbourhood, the neutralized liquors of the hydraulic main can be sold; otherwise these liquors must be got rid of by evaporation. The solution of 20° Beaumé from the washer can be distributed in a certain area. It contains, at ordinary temperature, about 300 kilos. of sulphate per cubic metre (weight, 1160 kilos.)—say, 260 kilos. of sulphate per tonne. Pricing the sulphate at 20 frs. per 100 kilos., such a liquor is worth about 52 frs. per tonne; and, as the cost for acid &c., is 31·2 frs., 20·80 frs. are left as the net value of 1000 kilos. of solution. Reckoning 2 frs. per tonne for cartage and the other incidental expenses, it is seen that a batch of 4000 kilos. of this liquor in 1000 kilo. lots is worth 73 frs. net. Reference to the freight charges on the French railways shows that carriage over a distance of 100 kilometres halves the net value of the liquors. These figures may be subject to slight modification by local conditions; but it is, nevertheless, easy to see that the railway companies have no need to fear exceptional developments in the carriage of ammoniacal liquors while their tariff remains as it is at present.

Passing to the means of neutralizing the ammoniacal liquors with sulphuric acid, the operations can be done in wooden vessels and with very simple apparatus. The acid is added in successive small doses, with agitation of the liquid after each, and the progress of the operation tested with litmus paper. As soon as the latter reddens (showing an excess of acid), the operation is finished by putting in a bucketful of ammoniacal liquor, so as to turn the paper blue again and to avoid leaving the liquor acid. A good deal of carbonic acid and sulphuretted hydrogen is evolved in the process. The neutralized liquor is then pumped up into a tank and allowed to enter the washer again. As its temperature rises during neutralization, a cooler is placed between the storage-tank and the washer. This can take the form of a small tower filled with shavings. A current of air is drawn from the bottom to the top.

In the case of works where it is not desired to go to even this small expense, it is sufficient to allow the solution to cool by delivering it down a long cord or board into the washer. This primitive means is efficient. An actual experiment showed that with the air at 17° C. the liquor was lowered in temperature from 31° to 18° C. on delivery at the rate of 2·5 litres per hour along a cord 10 mm. in diameter and 1·15 metres in length. As soon as the liquor in the washer reaches 20° Beaumé, it is put in stock for sale.

Reference should now be made to a method of producing ammoniacal liquors which can be distributed through a certain area. It consists in producing in a rotary washer ammonia muds containing also cyanide, which are afterwards treated by the buyer by a sulphuric acid process in the cold as was described in a previous communication. A cyanide mud is produced by passing the gas into sulphate of iron until a fraction of the ammonia is in the free state as compared with an ordinary ammoniacal liquor, another fraction, present as double ferrocyanide of iron of ammonium, and another as ammonium ferrocyanide. These cyanide muds, as stated before the 1902 Congress, were made with previous washing of the ammonia in a "Standard" washer of eight compartments, and have a composition given below. These figures apply to the normal muds—that is to say, after treatment with acid they contain an excess of soluble cyanide.

	A.	B.	C.	D.
Strength of ferrous sulphate solution (p.ct.)	5·00	10·00	15·00	20·00
Temperature of mud at outlet (deg. C.)	16·00	16·50	19·50	16·00
External temperature	12·00	3·00	11·00	14·00
Free ammonia	33·88	26·51	21·54	31·22
Combined ammonia	13·85	19·60	18·08	25·06
Total ammonia	47·73	40·11	39·62	56·28
Ferrocyanide	42·00	65·10	62·90	94·50
Density of mud	1·068	1·076	1·072	1·102
Ratio of ammonia to ferrocyanide . .	1·13	0·70	0·63	0·59

In the case of the above washer, only the last five compartments take part in the absorption of the cyanide; but experi-

—	A'.	B'.	C'.	D'.
Temperature of mud at outlet (deg. C.)	17·5	14·0	19·5	14·7
External temperature	15·0	5·0	13·0	13·0
Free ammonia	41·15	26·01	33·25	29·18
Combined ammonia	19·19	25·12	20·09	31·63
Total ammonia	60 34	51·13	53·34	60·81
Yellow ferrocyanide	71·40	96·60	72·5	122·80
Density of mud	1·078	1·078	1·088	1·103
Ratio of ammonia to ferrocyanide . .	0·84	0·53	0·73	0·49

ments have been made with a washer in which all seven compartments were employed for the simultaneous absorption of cyanide and ammonia. In this case, the muds were left for 24 hours to 48 hours longer in the washer; thus producing a set of conditions similar to those which would have been realized if the muds had had to pass another two compartments before being withdrawn. The last table on p. 42 shows the compositions of the muds after a further 24 hours in the washer.

The following are the compositions of A′ and D′ after remaining in the washer 48 hours longer than the time needed for normal saturation:—

—	A″.	D″.
Temperature of mud at outlet (deg. C.)	19·0	21·5
External temperature	20·5	12·5
Free ammonia	27·04	37·33
Combined ammonia	21·04	32·85
Total ammonia	48·08	70·18
Ferrocyanide	82·90	133·30
Density of mud	1·077	1·105
Ratio of ammonia to ferrocyanide	0·58	0·53

It will be seen that the muds of the composition of D, containing 70 kilos. of ammonia per cubic metre, equal to about that contained in the liquors neutralized 20° Beaumé, contained also more than 133 kilos. of yellow prussiate in the same volume. Calculating the total value of such a mud by reckoning the ammonia at 0·60 fr. per kilo. and the prussiate at 0·20 fr., we obtain, for 100 kilos., equal to about 900 litres:—

	Frs.	C.
63 kilos. ammonia at 0·60 fr.	37	80
120 kilos. prussiate at 0·20 fr.	24	00
Total value of 1000 kilos.	61	80

Assuming 30 per cent. of this value as the cost of treatment, the net value to the gas-works is about 40 frs. per tonne. As the 200 kilos. of sulphate required to produce the mud cost about 15 frs., the remainder of 25 frs. is the net value of a tonne of mud produced in this way—an amount which exceeds that obtained from a 20° Beaumé sulphate of ammonia liquor produced by successive neutralizations. A working on the above lines of 4000 kilos. of mud in 1000 kilo. lots would net 100 frs., and would allow of the product being distributed throughout a considerable area, while leaving a profit to the gas-works. The works would also benefit from the removal of the cyanides.

A word or two should be said as to the enrichment of exhausted purifying material with cyanide mud. This may be the last resource of a gas-works when unable to find a market for the mud. After neutralization with sulphuric acid, the latter may be employed to enrich exhausted matter from the purifiers. As it is possible to sell these products on the basis of the total enrichment, and at prices varying with the distance of the buyer, it can be seen that the mud D, containing 76 kilos. of nitrogen per tonne, would bring to its producers more than 45 frs. per tonne.

In view of the fact that the solubility of ammonium sulphate in water is of importance in this branch of residue recovery, the following table has been specially drawn up, and is worthy of circulation, inasmuch as many published figures are inaccurate:—

Degrees Beaumé, Density and Strength of Solutions of Sulphate of Ammonia in Water at 15° C.

Degrees Beaumé.	Density.	Sulphate in Grammes per Litre.	Degrees Beaumé.	Density.	Sulphate in Grammes per Litre.
4	1·028	52	17	1·133	242
5	1·036	66	18	1·142	260
6	1·043	80	19	1·151	278
7	1·051	54	20	1·161	298
8	1·059	108	21	1·170	318
9	1 066	122	22	1·180	338
10	1·074	136	23	1·190	364
11	1·082	150	24	1·199	392
12	1·091	164	25	1 209	420
13	1·099	178	26	1·220	448
14	1·107	194	27	1·230	476
15	1·116	210	28	1·241	504
16	1 125	226	29	1·251 (saturation)	532

Mr. Ernest W. Drew, F.C.A., of Messrs. Wood, Drew, and Co., has been appointed Secretary of the South Oxfordshire Water and Gas Company, in place of Mr. F. C. Robus, resigned.

As will be seen from the account which appears elsewhere of the visit of the members of the Société Technique du Gaz en France to Bournemouth last Wednesday, Mr. Corbet Woodall (who so conspicuously identified himself with the arrangements connected with the reception and entertainment of the party during their short stay in England) was unable to be present; but it was known to a few that the best of all reasons was the cause—the following day having been fixed for the marriage of one of his daughters, Miss Lilian Ruth Woodall, to Mr. F. W. Knight. In association with the events of the week, a delicate and much appreciated incident of the wedding was the delivery at "Walden," Chislehurst, the residence of Mr. Woodall, of a beautiful bouquet of flowers for the bride, on behalf of the Committee of the French Society.

THE USE OF ANTHRACENE OIL IN THE REMOVAL OF NAPHTHALENE.

By M. Léon du Pasquier.

[A Paper read before the Société Technique du Gaz.]

The Bueb process for the removal of naphthalene by anthracene oil was adopted by the writer in 1907—a rotary "Standard" washer being used. The condensing system included large iron mains, a collector of 1·1 metres diameter on the bench of the retort-furnaces, and a tube of 0·5 metre diameter conducting the gas to a cooler of 175 square metres of surface exposed to the north in the shade and capable, at all times of the year, of bringing the gas to ordinary temperature. The gas passed from the extractor to a Chevalet condenser, and then to three scrubbers supplied with ammoniacal liquor.

The naphthalene washer was placed after these scrubbers—immediately before the purifiers—in a covered house. It consisted of three compartments, each holding, at the normal level, 234 kilos. of anthracene oil. The working of the apparatus was adjusted to about four turns per minute; and the pressure did not amount to more than about 3 m.m. of water. Some difficulty was experienced in getting an anthracene oil sufficiently free from naphthalene; but an oil was finally obtained from the Röpert Factory, of Dessau, containing 4 per cent. of benzol, and prepared according to the directions of Dr. Bueb. When the washer was working, it was desired to discover what quantity of naphthalene was being extracted in each compartment per cubic metre of gas; but inquiry in Germany showed that there was no simple process for the estimation of naphthalene in anthracene oil. Even the largest German works were content to ascertain the gradual exhaustion of the oil by a system of fractional distillation worked out by Dr. Bueb. This method allows of the quality of the fresh oil being tested, and of its gradual saturation being determined. While it is accurate enough for working purposes, it is not sufficiently exact for experiments of a more scientific nature.

The following are the German directions for the process: 100 c.c. anthracene oil are distilled in a glass vessel of 400 c.c. capacity and provided with two tubulures, in one of which is a thermometer, while the other carries a condensing column 0·3 metre long. The liquid is distilled so that the distillate comes from the condenser at the rate of one drop per second. The distillate is divided into two portions—the first being that which comes over up to 200° C., and the second that obtained from 200° C. up to 270° C. This last fraction is the one which serves to determine the suitability or otherwise of anthracene for the absorption of naphthalene. The greater this portion, the worse is the anthracene for its work. A good oil should give not more than 8 per cent. of distillate between 200° and 270° C., and the distilled product should not deposit naphthalene on cooling for one hour to a temperature of 0° C.

The above instructions relate to the testing of the fresh oil. The following apply to the use of the oil and its complete exhaustion. When a certain quantity of gas has passed into the washer, and it is thought that the oil has become quite saturated (7000 kilos. of oil will wash 1,000,000 cubic metres or more of gas), a sample of the oil is taken each day from the first compartment of the washer, and distilled as above directed for the fresh oil. The quantity of naphthalene in 100 c.c. of oil is determined by collecting the portion of the distillate coming over between 200° and 270° C. The greater the increase in the volume of the distilled product, the greater the saturating power still possessed by the oil. When, on the other hand, the volume ceases to increase—which usually occurs when the 100 c.c. give from 18 to 25 c.c.—it may be taken that the oil in the first chamber is saturated, and it is then renewed.

This process was tried and found not to be sufficiently exact; and, therefore, attempts were made to find a simpler and more exact process. A supply of oil sufficient for treating the whole make of gas produced in one year was obtained; and its curve of solubility at temperatures from 0° to 27° C. was arrived at by supersaturating a known weight of oil with sublimed and finely powdered naphthalene. No apparatus is necessary, except a thermometer divided into fifths of a degree, and a balance reading to one centigramme; also a thin flat-bottomed flask of about 200 c.c. capacity with a long neck, about 0·15 metre, in which the liquid can be shaken without losing any water. The thermometer is placed near a vessel; the latter tared on the balance; and 100 gms. of oil poured in. Naphthalene is then added, at first in gramme lots, then in decigrammes—shaking the liquid well after each addition. This is done until the last decigramme remains deposited and insoluble at the bottom of the flask, when it is concluded that the liquor is saturated, and a note is made of the weight of naphthalene dissolved in the 100 gms. of oil. The temperature at the time is noted. This operation takes about two hours; and, with a little practice, the amount of naphthalene can be determined to within 0·1 gramme.

Having obtained about a dozen determinations at different temperatures between 0° and 27° C., the curve was constructed in which the abscissæ show the temperatures and the ordinates

the weight of dissolved naphthalene. The results are given in the following table:—

Table of Solubility of Naphthalene—100 Parts Dessau Oil.

Temperature.	Weight of Naphthalene	Temperature.	Weight of Naphthalene.	Temperature.	Weight of Naphthalene.
Degs.	Per Cent.	Degs.	Per Cent.	Degs.	Per Cent.
0	1·2	13	14·2	20	20·7
2	3·0	14	15 0	21	21·6
5	6·5	15	15·9	22	22·5
8	9·5	16	16·8	23	23·4
10	11·4	17	17·8	24	24·3
11	12·2	18	18·6	25	25·1
12	13·2	19	19·7	27	26·6

In order to estimate the naphthalene in the used oil, the same apparatus and methods of work are adopted; the room being kept constant at any required temperature. A note of this temperature was made; and as soon as the saturated liquid was obtained, reference to the above table gave the quantity of naphthalene dissolved in the oil. On subtracting the weight of naphthalene added, the difference gave the quantity of naphthalene in the oil on its removal from the washer. By reading, on the works meter, the volume of gas washed from the time of putting the oil into use up to the moment of taking the sample, and determining once for all the capacity of each section of the washer when filled to the normal level, it was easy, on testing the oil in all compartments, to calculate exactly—or at least to within 0·02 or 0·03 gramme—the quantity of naphthalene retained in each cubic metre of gas washed. The addition of the results gave the total weight of naphthalene contained in 1 cubic metre of gas. It is well to make sure that all the tar is extracted prior to treatment in the naphthalene washer; otherwise tar would mix with the oil and vitiate the results as regards naphthalene.

Obstructions still taking place after several months' working of the process, a test was made as to the amount of naphthalene extracted from the gas. The latter was led through two washing flasks containing anthracene oil, and at the rate of 20 litres per hour. The experiment lasted for twenty days, and was done on 10 cubic metres of gas at a temperature of 20° C. on the average. It was found that practically the whole of the naphthalene in the gas was extracted by the process; the residue amounting only to 0·03 gramme per cubic metre. It was also found that the proportion of naphthalene in the oil of the last compartment was 5·6 per cent., proving that so long as this oil is not allowed to absorb more than 6 per cent., there is a certainty of the gas being deprived of naphthalene down to the point of 0·03 gramme per cubic metre. Thus the tests made at the inlet and the outlet of the washer prove its efficiency.

A word should be said as to the injurious effect which water contained in the gas may have when it deposits in the washer. It being found that the washer was working badly, it was ascertained that the oil in the three compartments contained about 10 per cent. of water, which, it was thought, might have come from the thorough washing given in the scrubber.

The washer was then enclosed, and heated by steam in order to make a difference of 7° to 8° C. in temperature between the inlet and the outlet. The oil still showed the presence of water; and the apparatus worked badly. The idea then occurred to us of allowing the plates to rest for five or six days while the gas was passing through the washer. A kind of drying of the plates would then be produced. For this purpose, care was taken to give the drum a half-turn in order that the parts immersed in the oil might be deprived of their water. This device was successful; and the washing then became almost complete. Apparently, the success was due to the fact that the wood plates, when once they have been impregnated with water, no longer absorb oil, or at any rate not sufficiently. As a result, the oil, instead of forming an absorbent surface above its own level in the washer, immediately falls back into the bulk of the liquid.

It may be well, therefore, when one cannot keep the washer sufficiently warm, to place it at a point where the gas cannot carry water along with it. In consequence of this difficulty, the washer, although installed in January, was not working properly until May of the same year. Starting from this time, we made a rule not to saturate the oil in the third section further than 5 or 6 per cent. This means that the oil in the first compartment was renewed thirty-five times a year. Its saturation at the time of being taken out of use reached 12·8 per cent. in summer and 11·5 per cent. in winter. The washing of the gas made in one year is thus divided into thirty-five periods—each falling between two consecutive introductions of 234 kilos. of raw oil into the third compartment. These periods have had variable durations according to the amount of naphthalene in the gas, and have sufficed for volumes of gas from 45,000 cubic metres in the hottest times of year to 120,000 cubic metres during the coldest months. We have taken advantage of tests on the oil of the three compartments at the end of each period in order to ascertain as exactly as was possible the average amount of naphthalene in the gas deposited in each. The result is that, in one year, we have made thirty-five determinations of the quantity of naphthalene contained in the gas. This has been found to vary according to the temperature, and it appears of interest to endeavour to find some relation between the weight of naphthalene in the gas and the average lowest temperature to which the gas can be cooled and condensed in the works. For this purpose, the amounts of naphthalene were determined for each period of time between two successive changes of the oil in the washer; the temperature being measured as exactly as possible during each of these periods at the outlet of the condenser—since at this point (in the works now referred to) the gas reaches its lowest temperature. The surface of the condenser, which exceeds 20 square metres per 1000 cubic metres of gas per twenty-four hours, is more than sufficient to bring the gas at any moment to the temperature of the outside air. Our experience showed that by lowering the temperature of the gas in summer, the proportion of naphthalene was lessened; and we therefore watered the condenser during May, June, July, August, and September—thus reducing the temperature of the gas to 5° C. below that of the air, and diminishing the quantity of naphthalene in the gas by about 0·13 gramme per cubic metre.

At the outlet of the condenser, the gas temperature is not absolutely constant, and a mean temperature was ascertained. By hourly readings (during several days) of a thermometer placed at the outlet of the condenser, it was found that the average daily temperature was about equal to the half of the sum of the maximum and minimum temperatures attained during the twenty-four hours at the outside of the condenser. When the latter is watered, it is necessary, in order to obtain the mean, to take the sum of three infrequent readings—one at six o'clock in the morning, another at sunset, and the third at midnight—and divide this sum by three. In taking, during each period of washing with the anthracene oil, the average of the daily temperatures thus determined, a table could be compiled giving the mean temperatures for each month and the weight of naphthalene per cubic metre of gas extracted by the "Standard" washer. The results of these measurements are given in the following table:—

Time of Year.	Mean Monthly Temperature of Gas at Condenser.	Mean Quantity of Naphthalene Per Cubic Metre.	Weight of Naphthalene Saturating 1 Cubic Metre of Gas at Observed Temperatures.	Notes.
		Author's Determinations.	From German Table.	
Jan. . .	T = + 5	0·187	0·226	Condenser not sprinkled.
Feb. . .	T = + 5·5	0·203	0·238	"
March. .	T = 10	0·317	0·351	"
April . .	T = 13·5	0·377	0·410	"
May . .	T = 17	0·470	0·490	Condenser sprinkled.
June . .	T = 19·5	0·532	0·557	"
July . .	T = 21·4	0·615	0·610	"
August .	T = 22	0·635	0·628	"
Sept. . .	T = 19	0·520	0·550	"
Oct. . .	T = 16·2	0·452	0·471	"
Nov. . .	T = 12	0·360	0·383	Condenser not sprinkled.
Dec. . .	T = 7·4	0·270	0·286	"

We are thus led to the conclusion that the gas, if it had not been treated in the "Standard" washer, would have retained a quantity of naphthalene equal to that capable of saturating it at the temperature at the outlet of the condenser. The use of a "Table of Saturation" makes it possible for the process to be controlled by simply taking the temperatures of the gas at the condenser, in order to calculate from the number of cubic metres of gas made the quantity of naphthalene contained in the oil of the first compartment. This oil is then replaced as soon as the calculation shows that it contains about 13 per cent. of naphthalene, since experience has proved that when this proportion has been reached, it ceases to absorb more. This phenomenon is undoubtedly due to the fact that the passage of the gas through the "Standard" washer is too rapid; since by using the oil washer and at the same time a scrubber which has a surface area almost equal to that of the washer, and in which the oil can be kept in constant circulation by means of a pump, it was possible in August to work the oil up to 17 per cent. in the first compartment, while at the moment of charging the scrubber it contained only 13 per cent. From this study, it appears that the naphthalene in coal gas follows the ordinary law of the mixture of gases and vapours, and that benzol and other solvents of the naphthalene when in the liquid state seem to play no part of importance in the case of a gas of normal composition.

As regards the results of the process, which has now been in use for one year, the total number of obstructions recorded month by month shows a reduction of 22 per cent. compared with the previous year, when the process was not in use. Moreover, the inlet and outlet mains of the gasholders have not been giving trouble as was usually the case about every six months; and again for the same make, 4 m.m. pressure has been gained at the outlet main between the distributor and the works, on a total distance of 300 metres. It is calculated, therefore, that some few years must elapse before the gas now free from naphthalene can remove completely the deposits which still exist in the various parts of the system.

A point of importance is the cooling of the gas to the lowest temperature which it will ultimately reach. This, supposing that the surface of the cooling area is sufficient, is of importance in lowering the proportion of naphthalene. It is easy to calculate from the German "Table of Saturation," herewith appended (p. 45), the quantity of naphthalene which will be deposited by lowering this temperature a certain number of degrees.

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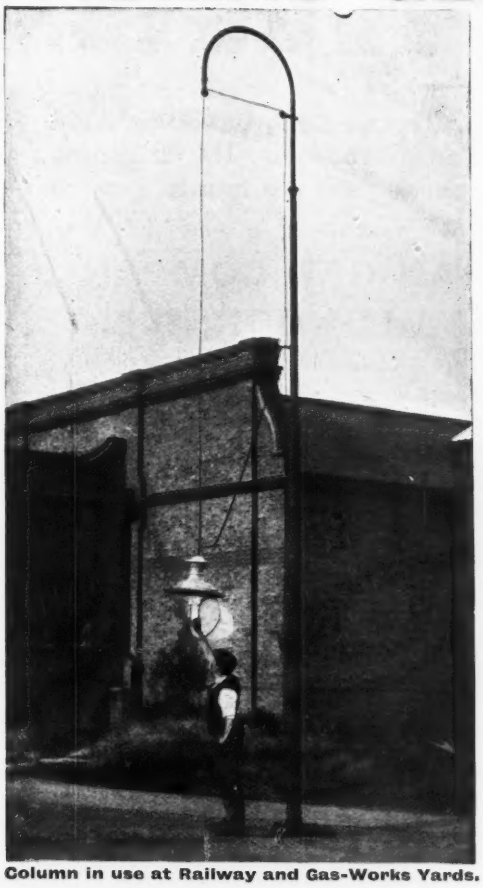

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See "Gas Journal," Jan. 22, 1907, p. 216; "Gas World," Jan. 26, 1907, p. 115.

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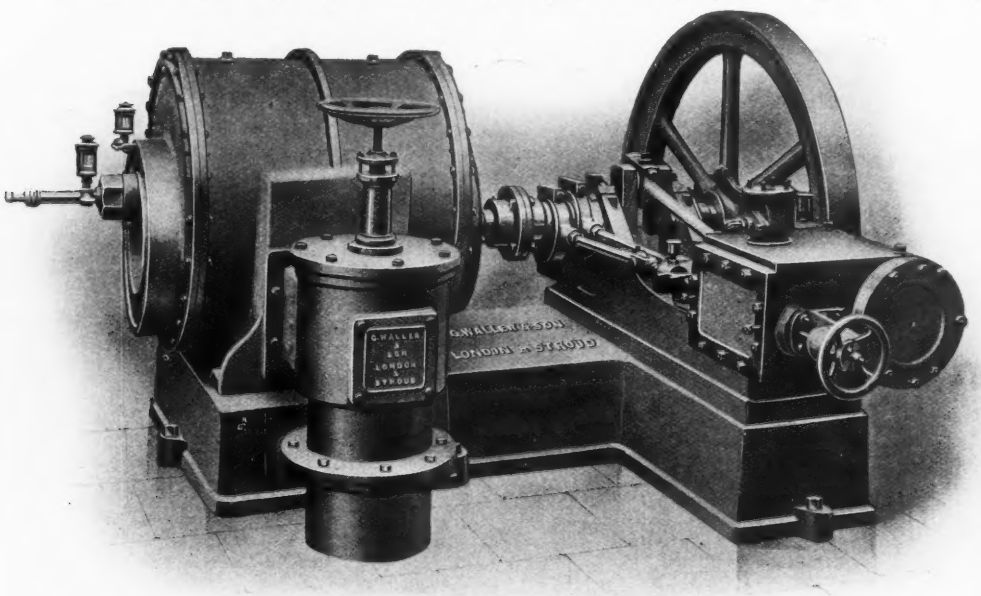

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Temperature.	Weight of Naphthalene.	Temperature.	Weight of Naphthalene.	Temperature.	Weight of Naphthalene.
Degs.	Gms.	Degs.	Gms.	Degs.	Gms.
0	0·140	12	0·383	27	0·795
3	0·192	15	0·440	30	0·915
5	0·226	18	0·518	35	1·340
7	0·276	20	0·570	40	1·932
9	0·326	22	0 628	45	3·055
10	0·345	25	0·715	50	4·813

The air condenser gives very good results during the months when the temperature is lower than that which the gas will have when it is underground—that is to say, in November, December, January, February, and March. But during the other months of the year an immersed condenser, or one which is watered, must be used. Thus, if water at 14° C. is available, one could very easily bring the mean temperature of the gas to 18° C., even at the hottest time of the year.

Supposing, now, that a works can effect this proper condensation of its gas when its mains are not blocked by naphthalene, and that the temperature of the mains varies from 10° C. in winter to 15° C. in summer, it may be well to inquire in what circumstances deposits of naphthalene are liable to take place. During the cold weather when the gas passes into the air condenser—the external temperature being often below that of the mains in the ground—it would not seem that any obstruction of the main can take place. The quantity of naphthalene which remains in the gas at temperatures between 0° C. and 10° C., varies from 0·14 gramme to 0·34 gramme, and cannot deposit in a main which has a higher temperature. In the case of the months from April to October, a water condenser will deliver the gas at a maximum temperature of 18° C.; and, as the outside temperature is rarely below that of the water, even during the night, obstruction of mains underground is not to be feared. The gas can encounter in the mains a temperature as low as 10° C., but the drop in temperature below ground will be limited to three or four degrees; and, as at 18° C. the proportion of naphthalene in the gas is 0·518 gramme per cubic metre, compared with 0·440 gramme at 15° C., the maximum weight of naphthalene deposited will not exceed 0·518 − 0·440 = 0·078 gramme. Moreover, this quantity should be taken up again by the gas in the winter, and therefore should not accumulate. Only experience can show if a deposit of this kind can be the cause of obstructions.

HISTORY OF PHOTOMETRIC STANDARDS.

By F. N. Morton.

[A Paper read before the Philadelphia Section of the Illuminating Engineering Society, U.S.A.]

(*Concluded from p. 945 of Vol. CII.*)

Pentane Standards.

Simmance's Two-Candle.—This consists of twin-burners each composed of a steatite tube fitted at the top with a brass plug 1 inch in diameter, and through the centre of which a hole ¼ inch in diameter has been drilled. Each burner has a stop-cock for regulating the flame. Two blue glass screens are provided, with cross wires at a height of 30 mm. from the top of the burners. The tubes unite at the bottom in one tube, which continues down to the base, then along, and then up to the pentane saturator or carburetter. This is circular, and is fitted with a spiral plate attached to the top of the carburetter, but not to the bottom—thus forming a baffle.

Sugg's Sixteen-Candle Argand.—This was similar to Sugg's ten-candle standard, except that it was not mounted on a meter; the argand was larger; and it was intended for use with pentane air-gas.

Dibdin's Ten-Candle Air-Gas Pentane.—This consists of a special argand burner mounted, together with a pentane reservoir of the bird-fountain type, upon a carburetter, consisting of a circular tin-plate vessel with spiral baffle-plate making a passage of 4 ft. 6in. for the air to traverse. On the side of the burner to be presented to the photometer disc is a metal screen 8½ inches high, screwed securely to the base-plate. The middle portion of the screen is cut away, leaving above the top of the steatite ring of the burner an opening 2·15 inches in height and 1·4 inches in width, the lower portion of the opening being exactly level with the steatite.

This standard was recommended for adoption by the Photometric Standards Committee appointed by the Board of Trade; but, in spite of the influence of the inventor, who was Superintending Gas Examiner to the London County Council, it was never adopted. As a matter of fact, however, this influence was neutralized by that of the inventor of the Harcourt ten-candle pentane lamp—one of the Metropolitan Gas Referees. Examinations of the lamp were made by Mr. Walter Grafton, who reported that it was nearly half-a-candle over the 10 candles, and that it was liable to variation from a variety of causes. It was also examined by a Committee of the Institution of Gas Engineers, who confirmed Mr. Grafton's report.

Harcourt Hydrogen-Pentane Standard.—Probably no other man has devoted anything like the time and study to the solution of the problem of obtaining a satisfactory light standard that Professor A. Vernon Harcourt has. In 1876, he reported that he had been working on one for two or three years, and had experimented on the use of air and hydrogen for absorbing vapours of "light petroleum" or pentane to make a standard gas. He preferred to use hydrogen, because with air a meter was necessary, and corrections had to be made for changes in atmospheric conditions; whereas with petroleum, by acting on an excess of zinc with a known weight of sulphuric acid, an accurately known quantity of hydrogen was obtained without any further correction. In making this gas, Harcourt floated 70 to 100 c.c. of pentane on water in a wash-bottle. He then let the hydrogen bubble through the water, evaporating the petroleum and driving the gas into a small holder. He found that a mixture of 1 part by weight of hydrogen and 3·91 parts of pentane would make a gas of 16-candle power rating.

Harcourt's Early Air-Pentane Standard.—Harcourt seems to have changed his mind in regard to the merits of air and hydrogen as a carrier for the petroleum; because a year later he described an air-pentane standard, making no mention of the first scheme. In this, he passed air through a Woulfe's bottle containing light petroleum floating on water, and burned the gas thus made in a burner consisting of a piece of 1-inch brass tube 4 inches long, the upper end closed by a plug ½-inch thick with a cylindrical hole ¼ inch in diameter. The height of the flame was $2\frac{5}{16}$ inches and was marked by a platinum wire. The mixture used was 600 volumes of air to 1 volume of liquid petroleum.

Harcourt's One-Candle Air-Pentane Standard.—Six years after (in 1883), Harcourt brought out a standard which he described somewhat in modified form in 1887, faintly resembling the present accepted form. It consisted of a reservoir of pentane above, feeding by gravity to a burner on a lower level. The pentane is fed drop by drop, through a piece of thermometer tubing, into a reservoir or carburetter. The flow of pentane is regulated by a piece of platinum wire inserted to a greater or less extent into the tubing. The air and pentane vapour are drawn from the carburetter through a pipe extending up from the bottom of the vessel, through the liquid and into the mixture above. The richness of the mixture depends upon the height above the level of the pentane in the carburetter. To adjust this, the bottom of the carburetter is connected with a rubber bag filled with water; the pressure being regulated by screwing a disc down upon the bag, and thus raising the level of the water and pentane in the carburetter. To assist evaporation in the carburetter, a copper disc, placed above the flame and heated by it, is connected with the carburetter by a copper arm. In the early form of this lamp, the flame height was gauged by a platinum wire fixed 2½ inches above the burner, which was the plugged 1-inch pipe before described; and a glass chimney surrounding the burner, but not extending above it, was used. With the 1887 type, a tubular cut-off was used.

Harcourt's One-Candle Wick Lamp.—This standard consists of a lamp with a wick and metal chimney surmounting a vessel, which may conveniently be made of glass. The wick only approaches to within 2 or 3 inches of the flame, conducting the liquid by capillarity to the tube where it is vaporized by the heat conducted down the tube. The flame is shielded at the top and bottom by the chimney, the space between which is adjusted to a set of gauges, determining the light. Tests of this lamp made by Dibdin in 1888 showed a maximum fluctuation of 2½ per cent., while 97 per cent. of the observations fell within 1 per cent. of the mean. In the same year, the Committee of the British Gas Association reported that out of 118 tests, only two showed fluctuations of 1 per cent., which was the maximum. C. H. Clifford, of the Massachusetts Institution of Technology, and Rawson turned in equally favourable reports. Until the Millennium, we shall probably not have any photometric standard to which some objection cannot be made; and so Walter Grafton, who has been quoted as defending candles and the Methven screen, rises up in criticism of this form of lamp. His experiments clearly show it to be reliable only between 60° and 70° Fahr., and of greater illuminating value than one candle.

Harcourt's Ten-Candle Wick Pentane Standard.—This lamp, which was described in 1894, is the same in principle as the one-candle lamp, except that it has an argand wick, which does not require cutting or trimming, as it does not approach the flame. The air admission to the inner tube is through a triangular opening; but to steady the flame, it was found necessary to fix a cylindrical case around the lower part of the tube. The flame is brought to the colour of the gas to be tested by admitting a small amount of air below the point of combustion. This is done by drilling a row of small holes through the outer tube, 15 mm. from its top. The chimney draught is enough to determine the entry of air through the holes. A short cylindrical screen surrounds the chimney. The bottom of it is 60 mm. above the surface of the burner; and both the screen and the chimney are surrounded by a pentagonal shade, four panels of which are filled with blue glass, while the fifth (which is turned toward the photometer disc) is filled half way down with a metal plate, which, overlapping the inner screen, allows only the light from the lower part of the flame to fall on the disc of the photometer. This was Harcourt's last effort before bringing out the present standard which bears his name, and which divides with the Carcel and Hefner the honour of being the standard of light accepted by many scientific, technical, and legislative bodies.

Harcourt's Ten-Candle Pentane Standard.—This has become the accepted standard in England; while in America it divides the honours with the Hefner lamp. It was exhibited before the Institution of Gas Engineers in June, 1898, and also before the British Association for the Advancement of Science in September of the same year. In 1898, it was prescribed by the London Gas Referees as the official standard. It is also the accepted standard of the National Physical Laboratory, and is used in the Electrical Testing Laboratory in New York.

The American form of lamp (which is illustrated) differs from the English in mechanical details, such as being of more substantial construction. The principal difference, however, is the metal pipe joining the carburetter with the burner, instead of the rubber hose of the English form.

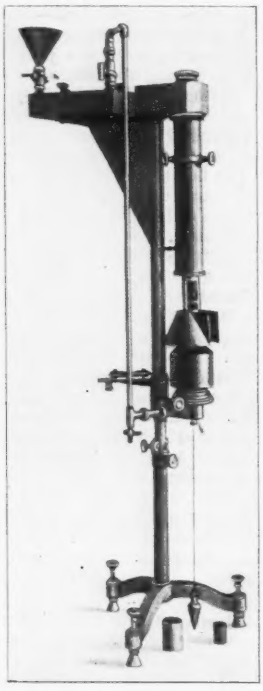


Fig. 1.—American Type of the Ten-Candle-Power Pentane Lamp.

The lamp comprises a rectangular carburetter containing baffle-plates, so that the air is forced to make eight trips before it is ready to pass down to the burner; the force necessary being obtained by the weight of the column of air-saturated pentane. The burner is a steatite-ring argand, surmounted at a height of 47 mm. by a brass chimney. The chimney is surrounded by an annular space which communicates to the burner in such a way that heated air is supplied for combustion. The flame is regulated by the stop-cock at the outlet of the carburetter to a height of $2\frac{7}{8}$ inches; the top of the flame being observed through mica windows in the side of the chimney. A conical shield, with an open side towards the bar, protects the flame from draughts. The apparatus is also provided with a spirit-level.

The lamp gives a white light of 10 candles; the colour of the flame and the luminous intensity making it peculiarly acceptable as a photometric standard. It has the further advantage of not using a wick, with the irregularities incident thereto; not requiring a glass chimney, with the possibility of imperfections in the glass and of setting it wrong side around or eccentric; and, since the top of the flame is screened, of being independent of slight fluctuations in flame height.

Tests were made by Mr. Rollin Norris, as Chairman of the Research Committee of the American Gaslight Association, on the possible variations in the luminous intensity of the lamp. The results, reported in the "Proceedings" for 1900, show that the pentane as commercially supplied (its quality being checked by analysis) exhibits no measurable difference in light-giving quality. Where the lamp is in constant use, however, and a large quantity of pentane has evaporated, the residue should be occasionally emptied out. A lamp burning continuously for a year showed no deterioration. A range of temperature from 75° to 100° Fahr. does not affect the light; nor is it seriously affected by a range of $1\frac{3}{4}$ inches in barometric pressure. Moisture in the air affects the light; but not enough experiments were made to establish the law.

I believe that this standard has been subjected to less criticism than any other that has been used or exploited to any extent. As far as I know, Mr. Walter Grafton—who said that its candle power is variable, that it is too greatly affected by temperature, and that the central draught is insufficient—is the only one who really raised any serious objections. Moreover, he read before the (British) Institution of Gas Engineers, a paper in which he concludes that when the parts of the lamp have been thoroughly

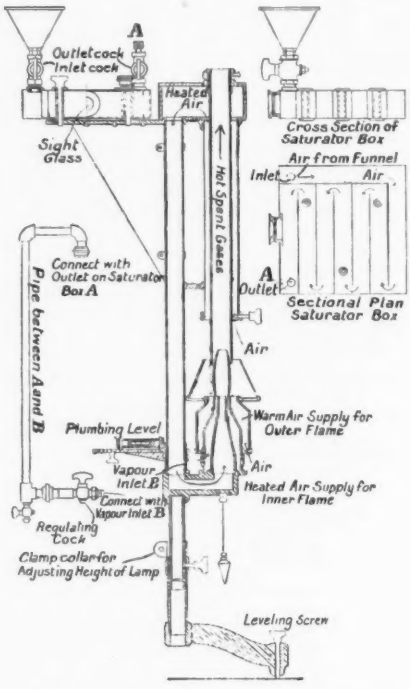


Fig. 2.—Sectional View of the Pentane Lamp.

heated, and the proper adjustments made, "the standard is worthy of being called by that name, and is as reliable as it is possible to get one."

This leaves the pentane lamp without an opponent—a position held by no other photometrical standard.

Hefner Amyl-Acetate Lamp.

This lamp, which was first brought out in 1884, has had great popularity, having been adopted in Germany by the Society of Gas Engineers in 1893, and by the International Electro-Technical Congress at Geneva in 1896. It was recommended as a temporary standard by the Committee of the American Institute of Electrical Engineers in 1897; and a brief discussion took place in 1898 before the same Association, but no formal action was taken.

It consists of a small lamp burning amyl-acetate by means of a wick made of cotton threads (from 15 to 20 in number) laid straight, until the total size of the wick is just enough to fill the wick tube, which is 8 mm. in diameter, without squeezing. It seems strange that this is the only requirement for what one would think such a critical point. The wick is raised or lowered by a toothed wheel, as in the ordinary kerosene lamp. In the early form of this standard, a glass chimney was sometimes used to steady the flame; but this has been discarded.

The height of the flame, which should be 40 mm., is gauged by a sight device, consisting of a short horizontal tube carried on a standard attached to the lamp, and along the axis of which is a horizontal plate. The tip of the flame should be just on a level with the bottom side of this plate as observed by sighting along it. An improved method of adjusting the height of the flame is by the Kruess optical gauge, consisting of a tube similar to the above, in the end of which (towards the flame) is a lens which focuses an image of the flame on a ground glass at the other end of the tube. A line marked on the ground glass admits of easy and perfect adjustment.

There has been much wrangling over the other standards; but I believe that more difference of opinion has taken place over the Hefner lamp than over any other single photometric standard. Some photometricians swear by it; others swear at it. In 1887, Dr. Bunte quoted a number of German authorities, all speaking most favourably of it; and in 1894, Dr. Lummer said that after a four years' examination he found that the unit varied not over 4 per cent. as long as the necessary conditions were strictly observed, and allowance made for varying meteorological conditions. On the other hand, Palaz, Dibdin, Vautier, and J. A. Fleming criticize the lamp, in some respects very severely. The objections to the lamp are: (1) its small intensity; (2) the red colour of the flame; (3) the great changes in illuminating power due to slight changes in height; and (4) the extreme flabbiness of the flame, which makes it waver and flicker in even the slightest draught and with the least shock or jar.

It has been claimed that the lamp is exactly reproducible, and hence will serve as a primary standard. It is difficult to accept this view, since a test by a Special Commission of the German Society of Gas Engineers of six standard lamps against the Physico-Technical Institute standard gave values ranging from 0·965 to 1·016. Another test by the same Commission found a difference of 2·9 per cent. between the illuminating powers of the

two lamps—one constructed by Siemens and the other by Kruess. And, finally, lamps of Siemens, Kruess, and the Physico-Technical Institute gave differences included between + 8·9 per cent. and – 3·2 per cent.

The amyl-acetate used is a colourless liquid having the chemical composition, $C_5H_{11}C_2H_3O_2$. It is prepared commercially by distilling amyl-alcohol obtained from fusel oil with a mixture of ethyl alcohol, sulphuric acid, and potassium acetate. Liebenthal investigated very thoroughly the influence of impurities, and he found that, with a flame height of 40 mm., the presence of water and of alcohol as existing in commercial amyl-acetate has no appreciable effect on the luminous intensity, but affects seriously the stability of the flame.

Effect of Atmospheric Conditions.

It has long been known that moisture, barometric pressure, &c., have an effect on the luminosity of all flames. Harcourt, in 1877, speaks of this; and in 1889, Methven read a paper describing his elaborate experiments to determine the effect of atmospheric conditions on candles and argand and flat-flame burners, as well as upon his own standard. He seems not to have formulated any law, however, nor did the other experimenters, until Liebenthal, in 1895, gave the results of his tests on the Hefner and pentane one-candle lamp, and deduced formulæ for the effect of moisture and barometric pressure for each.

The latest tests were made by Clifford C. Paterson, the results of which are given. The formulæ deduced are—

For Moisture.

Pentane lamp, C. P. = 10 + 0·066 (10 – E)
Hefner lamp, C. P. = 0·914 + 0·006 (8·8 – E)

For Barometric Pressure.

Pentane lamp, C. P. = 10 – 0·008 (760 – b)
Hefner lamp, C. P. = 0·914 – 0·0001 (760 – b), in which E = litres of water vapour per cubic metre of dry air, and b = barometric pressure in mm. of mercury.

Inasmuch as the carcel lamp was found to vary + 3 per cent. from the mean in one day, its constancy is indefinite, and no readings were taken.

Paterson did not state the effect of carbonic acid on the Hefner lamp; but Liebenthal found the correction to be in terms of its luminous intensity—

Hefner's = 1·012 – 0·0072 C., where C = litres of carbonic acid in dry and pure air per cubic metre. Multiplying by 0·915, the ratio of the Hefner to the candle, we have—

C. P. = 0·926 – ·0066 C.

Paterson made a series of tests on the effect of carbonic acid on the ten-candle pentane. His tests were not numerous enough to draw very definite conclusions; but from the figures he gives, I have derived a formula which applies fairly well throughout the range of his experiments. This formula is as follows :—

C. P. = C′ P′ – 0·297 (C – 0·23), in which C′ P′ = candle power corrected for aqueous vapour, and C = litres of carbonic acid per cubic metre, as before.

Relation of the Standards.

There has been as much difference of opinion in regard to the relative values of the standards as to their relative merits. The matter seems to have been settled, however, by the International Photometric Commission at the meeting last year, when the following ratios were adopted :

	Carcel.	Hefner.	Vernon-Harcourt.
Carcel	1·0000	10·75	0·9800
Hefner	0·0930	1·00	0·0915
Vernon-Harcourt	1·0200	10·95	1·0000

The standards selected for the atmospheric conditions are—

Barometric Pressure, 760 mm.

	Humidity—Litres of Water Vapour per Cubic Metre of Dry Air.
Carcel	10·0
Hefner	8·8
Vernon-Harcourt	10·0

Discussion.

The discussion which followed the reading of the above paper dealt chiefly with the three accepted lamps, the Hefner, the carcel, and the pentane, and some stress was laid upon the desirability of a perfectly reliable primary standard. The chief speaker was Dr. Clayton H. Sharp, who said that all the practical standards of the present time were flame standards. In these, there should be a definite burning material—one preferably of definite chemical composition; and combustion should take place under a definite set of conditions. These requirements had been imperfectly attained in the old British candle, and the first was to a considerable extent disregarded in the ten-candle pentane lamp—the pentane not being a definite chemical compound. The speaker admitted, however, that, as prepared to the Gas Referees' specification, its value was practically constant. The Hefner lamp used a burning material which was of definite chemical composition. The next requirement in a standard of light was that it should be reproducible anywhere and everywhere by any properly skilled person from a specification. Reproducibility of both the Harcourt and the Hefner lamps depended upon their accurate mechanical construction; and as accuracy might more easily result from simplicity, Dr. Seabrook appeared to think that the comparison was in favour of the Hefner standard—this being the lamp with fewest parts. The Hefner lamp had, however, the disadvantage of yielding only nine-tenths of a candle; its flame adjustment was difficult where affected by draughts; and the reddish colour of its light was against it as compared with the Pentane standard. In seeking for a standard of light, one was wanted which had a definite colour value. Another speaker (Mr. W. H. Gartley) pointed out that an enormous amount of work had been done by investigators in the determination of the relative values of the three accepted primary standards; and there was now only a small margin of disagreement.

REGISTER OF PATENTS.

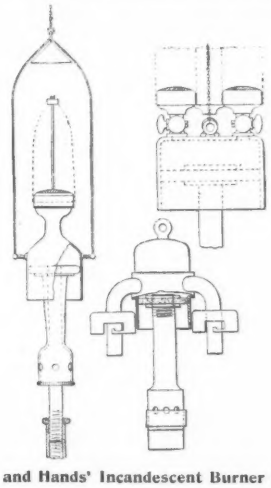
Incandescent Gas-Burners.

Turner, F., of Nottingham, and Hands, G., of Farringdon Road, E.C.

No. 12,354; May 28, 1907.

This invention relates to incandescent gas-burners of the type in which the bunsen tube is fixed and the part of the burner supporting the mantle is suspended with the object of preventing vibration. Such burners have usually comprised the bunsen tube attached to the ordinary gas supply pipe or other gas-fitting, and the upper part or mouth of the burner (in the case of an upright burner) is made more or less cylindrical or bell-shaped, so as to fit over the top of the bunsen tube; while the latter has been fitted with flanges and rings to produce a joint as tight as is consistent with allowing freedom of movement between the interior of the bell and the part of the bunsen tube fitting therein being obtained, either by grinding the rounded edge of the flange at the upper end of the bunsen tube to fit into the bell or by providing the upper end of it or the bell with a packing (such as a disc, washer, or ring) adapted to make-joint between the bell and the bunsen tube.

According to the present invention, the bell is freely suspended by a bridle and a chain or other flexible, but not resilient, connection; and combined with this method of suspension is an asbestos packing ring, which will not expand under heat, will work well as a piston, and be of a shock-absorbing nature. When there is more than one burner, the bell is suspended from its highest central point by a chain, link, or other flexible non-resilient connection. When provided as an inverted fitting, the burners are made in the form of a curved or bent and downwardly projecting tube provided with mantle supports equidistant from each other; while the bell is supported at the top as before.



Turner and Hands' Incandescent Burner Fittings.

In order to regulate the position or height of the flange at the top of the bunsen tube, in the bell, and, consequently, the capacity of the chamber formed in the bell, and to facilitate the removal of the bunsen tube for cleaning purposes, the lower end of it is connected to the gas-fitting by a nose pipe or nipple with a long screw, and a lock nut, set-screw, or the like. This permits of the removal of the bunsen tube with the minimum amount of movement being communicated to the bell.

The illustration shows a view partly in elevation and partly in section of an upright burner constructed according to this invention; an elevation of an upright cluster burner; and a cluster burner of the inverted type.

Prepaid Gas-Meters.

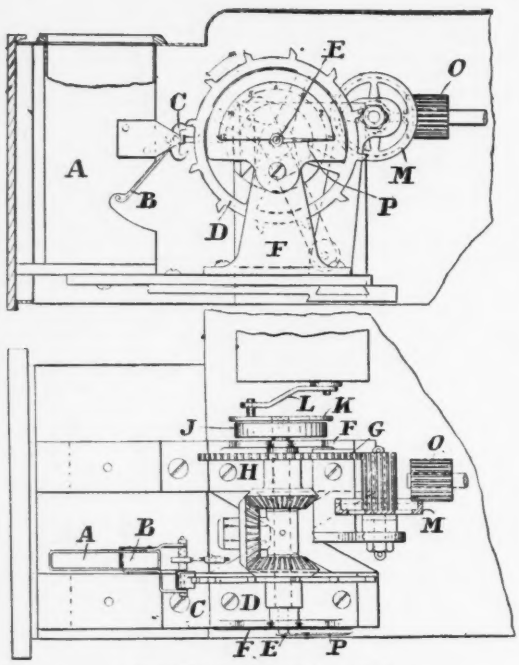
Bostock, F. H., of Nottingham.

No. 14,815; June 27, 1907.

This invention relating to prepaid gas-meters refers to delivery or valve-controlling mechanism of the kind which is actuated by the action of a coin passing down a shoot on its way to the receptacle provided for it, and which mechanism indicates the amount of gas prepaid and still unconsumed, and may also comprise counting mechanism for indicating the number of coins inserted.

The meter is provided with a preferably vertical coin-shoot A formed with a sector-shaped opening on one side into which the lower member B of a lever projects, so that a coin passing down the shoot must push aside and oscillate the lever, the return movement of which is effected by a weight on its upper member, or a spring (as preferred). The lever carries escapement pallets C, which engage with the teeth of an escape

wheel D, mounted loosely on a preferably horizontal shaft E carried in bearings in a frame F, secured within the upper part of the meter. The escape wheel is connected by epicyclic gearing to a toothed wheel G mounted loosely on the shaft as the escape wheel. The wheel G is, in turn, connected to the registering mechanism of the meter by gearing hereafter described; and it is turned in the reverse direction to the escape wheel D, together with the registering mechanism, when gas is being supplied. At other times it is stationary.



Bostock's Prepayment Gas-Meter.

The gearing for connecting the wheels D and G is comprised of three mitre wheels—one secured on the side of the escape wheel D, another on the side of the wheel G, and a third connecting the two former. This third wheel H is carried on a radial axle secured to the shaft E; and it can therefore rotate on its own axis, and also move about the shaft E. In the latter case, it carries the shaft E with it.

The escape mechanism is actuated by a clock spring J acting on the shaft E. The spring is between the bearing frame F and a disc K on the rear end of the shaft; the inner end of the spring being connected to the shaft and its outer end to the frame F. The spring is set so that it will turn the shaft E in the direction indicated by the arrow when the escape wheel is released by tripping the pallets C. The disc on the shaft E is provided with a crank pin which acts on the supply valve lever L; the pin engaging the lever L and closing the supply valve whenever the shaft E is returned to its normal position (as shown).

When a coin is passed down the shoot A, it trips the escapement pallets C and releases one tooth of the wheel D, and allows the latter, which has twelve teeth, to make one-twelfth of a revolution. The wheel attached to the wheel G being either stationary or moving in the reverse direction to D, the movement of the latter will cause the wheel H to roll on the wheel and move the shaft E in the same direction as the wheel D, but only one-half the distance. This movement releases the supply valve lever L; and the valve remains open until the shaft E has been returned to its normal position by the rotation of the wheel G in the reverse direction to the escape wheel D, when the reverse action takes place. The wheel D being held by the pallets C, the wheel H will return the shaft E to its original position, and close the valve.

The epicyclic gearing described serves to connect the valve-controlling mechanism—that is, the shaft E—with the crank pin, both to the escape wheel D and to the meter-registering mechanism; and the valve is opened by a movement of the former and closed by the latter, through the intermediary of the gear.

If twelve coins were passed through the shoot A in succession, the wheel D would make a full revolution and the shaft E half-a-revolution; and the wheel G would have to make a full revolution in the reverse direction to D, in order to return the shaft E to its normal position and close the supply valve.

The wheel G is connected to the registering mechanism of the meter by means of a crown wheel M and pinion mounted on an axle carried by a bracket secured to the frame F. The crown wheel gears with a pinion O on a shaft geared to the registering mechanism; while the pinion gears with the wheel G, so that as the gas passes through the meter and operates the registering mechanism. This wheel G is turned in the reverse direction to the escape wheel D, and, through the intermediary of the epicyclic gearing, returns the shaft E to its normal position and closes the supply valve, while the escape wheel remains stationary.

As the escape wheel D is let off a number of teeth equal to the number of coins inserted, and the wheel G must be turned in the reverse direction to the escape wheel D, and through the same space as the latter, before the shaft E is returned to its normal position and the supply valve closed, the amount of gas supplied for each coin inserted is determined by the ratio of the gearing which connects the wheel G to the registering mechanism. The wheel and pinions are arranged (as shown) so that the gearing can be readily changed to suit the price of gas in any particular district.

Incandescent Gas-Burners.

HOLMAN, S., of Kensington, W.

No. 14,158; June 19, 1907.

This invention has for its object so to provide a burner in which "such an intimate admixture of gas and air is secured that the mixture, although weak, will ignite and burn steadily and without the possibility of firing-back."

Holman's Incandescent Gas-Burner.

On the end of the burner proper is a tube, the end of which is tapered, and which is connected to the burner by a sleeve. Within the tube is a plug, tapered at one end to a degree corresponding to the taper of the tube, and provided upon its periphery with a number of longitudinal recesses, preferably V-shaped in section and diminishing in cross sectional dimensions from the larger to the smaller end of the plug. Thus, when the plug is fitted into the tube so that its tapered end bears against the tapered end of the tube, the gas issuing from the burner proper is caused to pass first through the reduced portions of the V-shaped recesses so that the pressure is considerably reduced; while upon the plug being inverted, the gas is not caused to pass through the reduced portions of the longitudinal recesses, and the pressure of gas is increased. Such a plug serves at the same time for the reception of the mantle-carrier stem, whose extremity passes into a central hole formed within the plug.

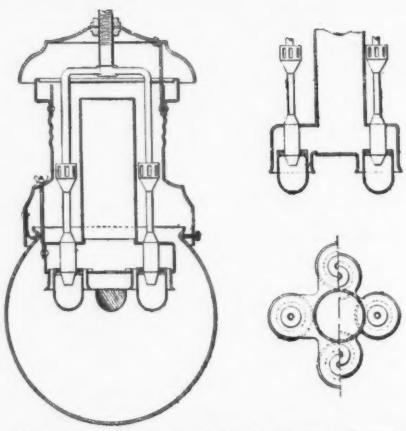
There is a cap of wire gauze on the outlet of the burner to serve as a mixing or expansion chamber for the air and gas, the top face of which is preferably formed concave, so that the outcoming gas may be evenly distributed. It is in two parts—a cylindrical part, the upper extremity of which is enlarged or flared outwardly; and a circular covering part, the edge of which is bent over so as to lie outside the outwardly flared extremity.

Incandescence Gas-Lamps.

HARRISON, C. W., and NOAD, A. C., of Middlesex Street, E.

No. 19,811; Sept. 4, 1907.

This invention has reference to lamps in which there are several bunsen burners of the inverted type, arranged so that the ends to which the mantles are attached lie inside, and the air admission openings to the burners lie outside the heat zone—"thus preventing the air that passes to the burners for admixture with the gas from becoming contaminated with the products of combustion, and also lessening the heating of the burner-tube."



Harrison and Noad's Incandescent Burner Lamps.

As shown, each burner has a separate and independent draught, and a partition separates the burner mouth or lower end of the burner from the upper portion of the burner in which is the air intake—thus "preventing the products of combustion from unduly heating the upper portion of the burner, or vitiating the air which enters the air intake."

This is accomplished by means of a concentrically arranged cylindrical chamber communicating with the lower end of the main flue. The chamber has formed in its lower face holes corresponding in number to that of the burners with which the lamp is furnished. Each hole is provided with a circular depending lip or flange bent outward at its lower edge. The burners extend (preferably vertically) through the cylindrical chamber, and the lower ends receive the mantles, which lie with their upper ends surrounded by the flanged edges of the holes in the lower face of the cylindrical chamber. By reason of there being no central opening in the lower face of the cylindrical chamber, the draught of air that enters the globe on its way to the uptake or flue is compelled to pass through the openings immediately surrounding the mantles, "with the result that the tendency to blow the flames to one side will be overcome, and a satisfactory incandescence of the mantles thus obtained."

According to the modification shown, instead of employing a concentrically arranged cylindrical chamber at the lower end of the uptake or flue, this may be made with a closed bottom, and a number of radially disposed tubes or chambers may communicate with the uptake or flue and be open at their lower or outer ends. These chambers correspond in number to the burners, which at their lower ends project through the upper wall of the tubes and enter their open ends to receive the mantles.

Gas-Producing Apparatus.

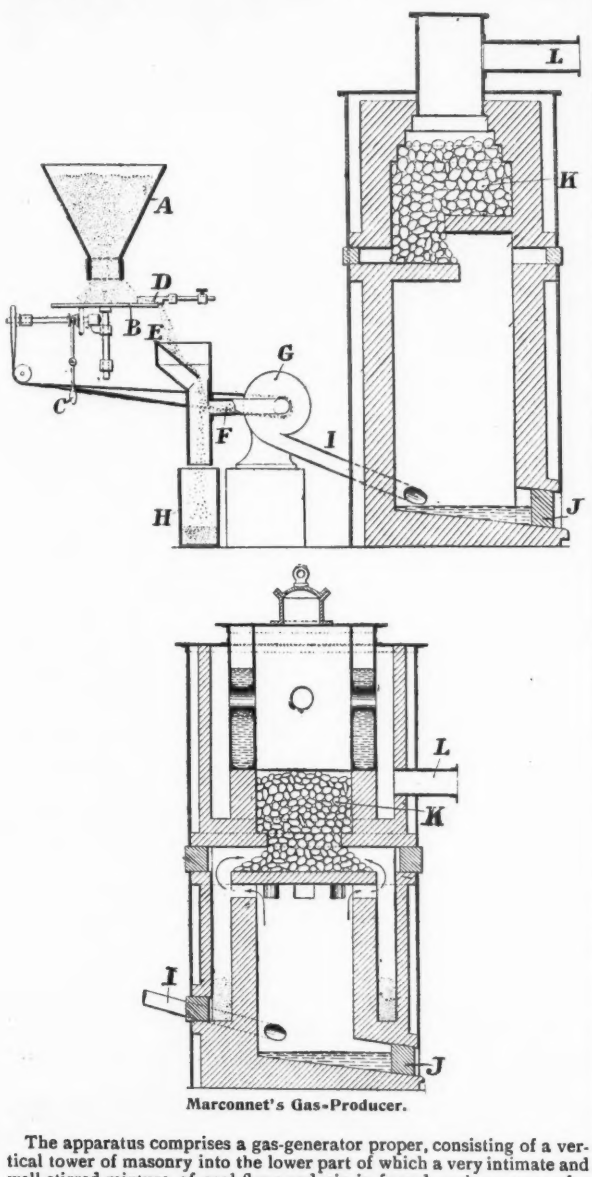
MARCONNET, G., of Paris.

No. 21,124; Sept. 23, 1907. Date claimed under International Convention, Oct. 8, 1906.

This invention relates to gas-producing apparatus in which a mixture of powdered coal and air is drawn in or injected tangentially by means of air under pressure; and it has for its object "to provide apparatus suitable for the production of a combustible gas, adapted for heating purposes or for motive power, from small combustibles of low price."

The combustible, before being admitted into the gas-generator proper, is reduced to fine powder in suitable apparatus. This fine powder is burnt in the gas-generator in the presence of a quantity of air which is so proportioned that the gas produced shall be rich in oxide of carbon and in hydrogen.

The combustion is effected in such a way that the operation of cleaning may be easily carried out; in reality the usual cleaning operation is replaced by a tapping off of vitreous clinker—the temperature obtained and the form of the apparatus being such that the production of tars is avoided. The gases obtained only require to be washed to be freed from dust.



Marconnet's Gas-Producer.

The apparatus comprises a gas-generator proper, consisting of a vertical tower of masonry into the lower part of which a very intimate and well stirred mixture of coal flour and air is forced as by means of a blower. The apparatus also comprises means connected with the blower whereby the pulverulent combustible is supplied thereto in variable quantities controlled by the speed of the blower itself.

The illustrations show, in central vertical section, the general arrangement of apparatus embodying the invention according to one construction, and a gas generator furnished with means for generating water vapour.

The lower end of the hopper A terminates in a cylindrical portion open at its lower end, and on which is mounted (to slide with slight friction) a cylindrical collar. Some distance below is a horizontal plate B, keyed upon a vertical shaft mounted to turn in bearings. The plate bears upon a friction roller arranged to slide upon a horizontal shaft mounted to turn in bearings. The roller can be moved towards, or away from, the centre of the plate B by means of a fork lever C. In this way, for a constant speed of the shaft there may be obtained a variable speed of the plate. Powdered coal placed in the hopper spreads itself out over the plate B in the form of a cone, the wall of which is constantly sliding downwardly, and the height (and consequently also the diameter) of which depends upon the distance between the bottom of the cylindrical collar and the revolving plate. This distance is regulated by lowering or raising the cylindrical collar. The plate carries around with it a cone of powdered coal into which a small scraper D extends to an adjustable extent. For this purpose, the scraper is mounted to slide in two guides, and can be locked in any desired position by a clamping screw.

Under the action of the scraper D, and by the rotation of the plate B, there is produced a stream of powdered coal the size of which increases according to the increase in speed of the rotating plate, and according to the extent to which the scraper is engaged in the cone of powdered coal, as well as to any increase of the distance between the plate and the cylindrical collar. As the scraper removes the coal, more powdered coal slides down from the hopper, so that the cone of coal on the rotary plate is continually being reformed.

The powdered coal falls on to an inclined plate arranged to turn about a shaft E. The powdered coal slides over the plate and falls from it in a shower of fine grains in front of the suction opening F of the blower G. The inclination of the plate determines the quantity of powdered coal passing the suction opening. The particles of coal likely to be insufficiently burnt through being too heavy cannot be drawn in by the blower G, so that they are received in a box, from which they are taken out at intervals to be re-ground.

The generator proper comprises a vertical tower of refractory masonry to the lower part of which the injection nozzle I of the blower G blows in the intimate mixture of powdered coal and air in properly proportioned quantities. For the purpose of igniting the mixture in the generator, some ignited wood is passed through a door J, which also serves for cleaning purposes. The fine coal dust carried along by the air forms a cloud, which "inflames readily on contact with the burning wood, and thereby produces a powerful blow-pipe jet, under the influence of which the walls of the generator become rapidly heated to redness, and the combustion then continues of itself."

At the commencement of a gas-producing operation a certain quantity of carbonic acid gas is formed; but as the temperature at the lower part of the gas-generator soon reaches close upon 1500° to 1600° C., this is dissociated so that the products of combustion which pass towards the top of the generator comprise carbonic oxide, hydrogen, and coke resulting from the combustion of the hydrocarbons and oxygen. "As these products move towards the upper end of the generator, the combustion of the coke is completed, and the gases thereby become capable of use for heating purposes and for the production of motive power."

To guard against the effect of any irregularity in the distribution, or any momentary lack of powdered coal, the gas generated is caused to traverse a reducing column consisting of a quantity of coke K, placed in pieces in the upper part of the apparatus and resting upon two baffle-slabs. The gas leaves the generator by the pipe L leading to the apparatus where it is to be used.

With apparatus arranged as described, and by reason of the high temperature at which the reaction takes place, the tar is completely dissociated, it is said; and there only remain in the gas produced traces of ammoniacal compounds, so that such gas only requires washing to free it from dust before being used. If to be employed for the production of motive power, it is advantageous for the gas to be rich in hydrogen. For this purpose, water vapour may be injected into the generator at a point slightly above the injection nozzle I of the blower. This water vapour may be supplied from an independent source; but it is preferable to produce it by means of a boiler near the upper part of the gas-generator, as shown.

Heating Attachment for Inverted Gas-Burners.

ROSENTHAL, M., of Berlin.

No. 26,731; Dec. 3, 1907. Date claimed under International Convention, Feb. 21, 1907.

This invention relates to apparatus specially adapted for heating rooms, of the kind in which a downward and obliquely suspended bunsen burner is provided with a reflector having openings and heated by the flame and throwing the rays of heat into the room. The invention (under the title of "The 'Honec' Gas-Heater") was described and illustrated in the "JOURNAL" for Dec. 31, 1907, p. 979.

Gas-Controlling Appliances.

TOURTEL, J. M., of Chiswell Street, E.C., and MEALING, W. R., of Twickenham, S.W.

No. 24,010; Oct. 30, 1907.

This invention relates to apparatus used for turning on and turning off street and other gas-lamps by means of temporary increases of pressure in the mains. It refers to the class of apparatus in which diaphragms, liquid sealed bells, or the like, are employed; the diaphragms or bells being operated by gas pressure admitted to them through vessels having tubes or openings and containing oil, water, or other liquid. These "controllers" are so arranged in relation to the liquid that they remain sealed at or below ordinary maximum or other known pressures, and become unsealed when the pressure exceeds the ordinary maximum or rises to any other predetermined pressures, at which time the gas passes freely through the controllers to the diaphragms and causes it to turn on or off the gas to the burner by operating the tap or cock.

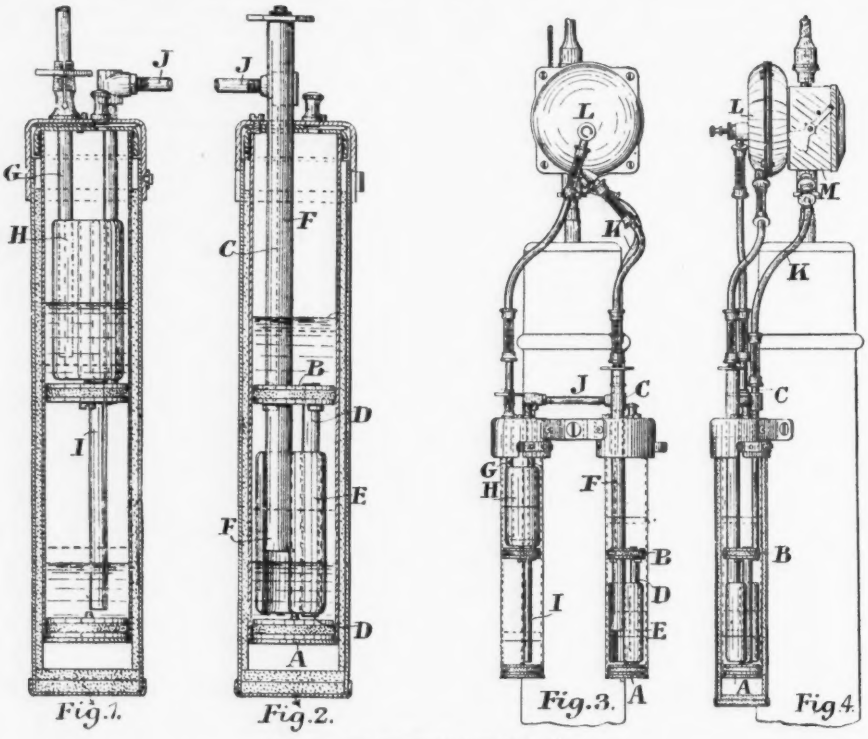
The controller—fig. 2, p. 49, and its counterpart in figs. 3 and 4—consists of a glass tube arranged inside a case provided with a cover. The tube is plugged at A, and has in it a partition B, consisting of an elastic disc between two metal plates. An inlet tube C passes through the cover and partition into the lower chamber, which is connected by the liquid tube D with the upper chamber. A block or displacer E is arranged in the lower chamber (to reduce its area), making it small in comparison to the area of the upper chamber. An outlet tube F passes from the lower chamber through the case, and is connected to the diaphragm in the manner described in patent No. 7197 of

1907; and the functions of the controller are practically the same as those there described.

The glass tube and case of the controller shown in fig. 1, and also in fig. 3, are similar to those in fig. 2; but the outlet tube G terminates in the upper chamber, and the displacing block H is arranged in the same chamber. The lower chamber receives the end of the inlet tube and communicates with the chamber above by the liquid tube I. The outlet tube G is connected to the diaphragm, liquid sealed bell, or equivalent; and in the examples shown the gas inlet pipes are connected to each other by the branch pipe J and the pipe K to the gas supply.

The operation of the device is as follows: Assuming the pressure to be temporarily increased to the required extent, the pressure enters the two controllers simultaneously. In the one case it forces liquid from the lower to the upper chamber, thus unsealing the end of the tube F, and, passing through it, operates the diaphragm in the case; thus turning the gas-tap enclosed in the case M. While this is taking place, the pressure enters the lower chamber of the other controller and, forcing liquid therefrom into the upper chamber, seals the end of the tube G; thus preventing gas held in the diaphragm case from escaping. The diaphragm is in this way prevented from returning to normal position until the pressure is reduced sufficiently to allow enough liquid to pass back into the lower chamber to unseal the tube.

After the diaphragm has operated the tap, any variations above a known degree in the pressure of the gas will be inoperative, because the



Tourtel and Mealing's Gas-Controller.

diaphragm cannot move the gas-tap until it has been allowed back to its normal position; and this is only permissible by the reduction of pressure to the known degree, which can be varied by adjusting the tube G. When the pressure has been sufficiently reduced, the tube becomes unsealed, and the gas in the diaphragm escapes through the tube into the upper chamber, and from there to the atmosphere, through the packing between the case and the glass tube or otherwise.

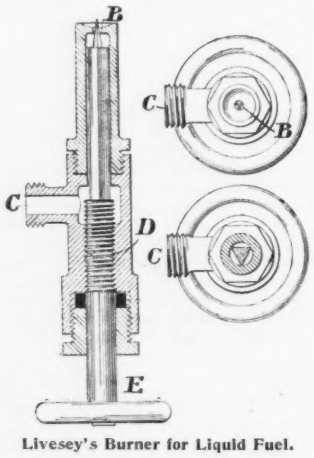
In figs. 3 and 4, the tubes outside the controllers are shown provided with adjustable connections; and the controllers have lugs for attachment to the lamp column. The lower part only of the gas-burner is shown. A set-screw serves to regulate the gas passage from the diaphragm to the tube G.

Burners for Liquid Fuel.

LIVESEY, GEORGE, of Old Kent Road, S.E.

No. 2207; Jan. 31, 1908.

In burners for liquid fuel there is always a difficulty, the patentee points out, in keeping them clear, and in regulating to a nicety. Various



Livesey's Burner for Liquid Fuel.

devices have been employed on the needle-valve principle; and, among other contrivances, a twisted reamer has been used, which can be screwed up and down in the barrel of the burner to clear it of deposit.

As shown, the barrel of the burner has a cylindrical interior with a nozzle about 1½ inches long (screwed in the end) and an orifice B. C is a lateral inlet for the liquid fuel. D is a screw within the barrel somewhat remote from the orifice B and below the inlet. E is a spindle which is triangular as at F in cross section for the greater portion of its length, and fits the internal dimensions of the nozzle. The spindle has a part which screws into the threaded portion D of the barrel when the spindle is turned by the hand wheel. The spindle terminates with a triangular spike which passes into the orifice B, and clears it out when the spindle is screwed home to bring the shoulder on the spindle up against the end of the nozzle so as to close the orifice. The triangular spike also performs "the necessary and important operation" of regulating the flow of liquid fuel to the burner. By the use of the spike "a much larger hole can be used at the point of the nozzle, and all the trouble attending the choking of the barrel or the aperture avoided."

APPLICATIONS FOR LETTERS PATENT.

13,260.—BROUGHAM, F. J., "Gas-engines." A communication from the Southwark Foundry and Machine Company. June 22.

13,317.—WILLIAMS, T., "Acetylene generator." June 23.

13,321.—WALE, J., "Globe or chimney." June 23.

13,324.—GUMPRECHT, F. G., "Inverted gas arc lamp." June 23.

13,348.—CHOLTUS, J. E., and JEANESSON, H., sen., "Combined heating and cooking stoves." June 23.

13,360.—DIXON, A. W., and MIDDLETON, E., "Pyrometers." June 23.

13,389.—BAXTER, W., "Gas-engines." June 24.

13,439.—KRIMER, M. L., and TEE, G. A., "Gas flash-light apparatus." June 24.

13,476.—STONEHOUSE, T. D., "Prepared fuel." June 25.

13,524.—CAMBRIDGE SCIENTIFIC INSTRUMENT COMPANY, LIMITED, "Thermostatic regulators." A communication from the Hohmann and Maurer Manufacturing Company. June 25.

13,526.—CAMBRIDGE SCIENTIFIC INSTRUMENT COMPANY, LIMITED, "Thermostatic regulators." A communication from the Hohmann and Maurer Manufacturing Company. June 25.

13,549.—JAMES, G. E., "Preventing back-draught or down-draught in the fume-pipe of gas-stoves." June 25.

13,558.—GOODSON, J., "Gas-regulators." June 25.

13,591.—JERVIS, J. J., "Charging retorts." June 27.

13,621.—WEBBER, J., "Incandescent gas lighting." June 27.

13,656.—DURKIN, F., "Purifier grids." June 27.

13,673.—MANGIAMELI, F., and ROSA, E., "Acetylene generators." June 27.

In order to supplement the gas supply, and obviate the erection of an additional holder, the New Mills Urban District Council have decided to erect a water-gas plant at their gas-works.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Cost of Gas and Electricity for Public Lighting at York.

SIR,—In the "Electricity Supply Memoranda" in the "JOURNAL" for the 30th ult., reference is made to a comparison between incandescent gas-burners and Osram electric lamps for public lighting at York. But there is something behind the figures which makes the comparison still more in favour of gas. The price we charge for a No. 3 Kern street light, £2 11s. 9d. per annum, covers everything—*i.e.*, we lay the service-pipes, provide pillars, lanterns, and burners free of cost to the city, painting and renewing these (as well as paying the lamplighters to light, extinguish, and clean), and supplying gas for 3443 hours; whereas the £2 17s. per annum charged by the Electricity Committee to the city is insufficient to cover even the price of the current. The two Osram lamps in each lantern use 264 units in 3443 hours, and at 3d. per unit (the price charged for current to the Corporation departments) amounts to £3 6s. In addition to the electricity, there is the cost of seven Osram bulbs (lasting 1000 hours) at 4s. each, or 28s., and the wages of the lamplighter who every night and morning has to turn on and off each lamp, renew the bulbs, and keep the lamps clean. Consequently, the charge ought to be nearer £5 7s. than £2 17s.; the latter price having been arbitrarily fixed upon to make as favourable a comparison with gas as possible. The obvious conclusion, therefore, is that the electricity undertaking is losing money at the price, while the ratepayers are mulcted in 72 per cent. extra cost, light for light, than with gas.

JOHN H. HILL,
Secretary and Manager, York United Gas Company.

York, July 2, 1908.

A "Daily Mail" Puff.

SIR,—I enclose for your perusal a cutting from the "Daily Mail" of June 25, in which it is stated that electricity used with a transformer is 70 per cent. cheaper than gas. I myself have not yet seen or heard of any electric lamp that consumes less than one watt per candle power; and if none exist, I fail to see where any advantage comes in, only that the consumer may have one lamp fixed in place of a pair, as already in use through the high voltage.

Further, should we take the figures published, I am afraid there will not be many people who are using any artificial light at the present time who will feel inclined to go back to flat-flame burners or oil-lamps, for it is stated that by the adoption of these transformers a consumer may have his premises lighted with ten 8-candle power lamps at a cost of ¾d. per hour, whereas six incandescent burners, consuming 28 cubic feet of gas per hour, cost 1d. Why these 8-candle power lamps are quoted in preference to the 32, 60, and 100 candle power lamps, when the people are all clamouring after a better light, I do not know; but I come to the conclusion that they have been adopted to lead the unwary public astray.

Unfortunately, figures very much like these are already quoted in districts similarly situated to Aberystwyth, where the townspeople depend to a certain extent upon visitors, and go in for what is best suited to their particular businesses. The figures are misleading to these people, who do not know anything about the merits of candle power. Notwithstanding this, however, I will take them upon the figures quoted, and see how they compare with gas, claiming only 20-candle power per cubic foot used, which I know is very low now, with the improved burners in use and upon the market. These will work out, at the figure mentioned: 28 cubic feet multiplied by 20-candle power equals 560 total candle power, against 18 electric 10-candle power lamps equalling 180-candle power. The former costs 1d. and the latter ¾d. per hour—showing in favour of gas 380-candle power for the extra ¼d.; or, taking candle power per candle power, 180-candle power equals ⅓d. for gas against ⅓d. for the electric light.

J. GAUNT.

Aberystwyth Gas-Works, June 30, 1908.

[Our correspondent will see that the subject of his letter is dealt with in our "Electricity Supply Memoranda."—ED. J.G.L.]

Mr. Bywater's Paper on Refractory Material.

SIR,—The subject of the paper on "Refractory Material" read before the Institution of Gas Engineers by Mr. Bywater, with the discussion which followed, is not likely to be allowed to remain where it is; and, in fairness, the other side should be heard. At the same time, the trade are indebted to you for your very temperate leader on a difficult question.

I think we may take it that the point at issue is principally confined to retorts, and that the chief difficulty experienced in working them is their liability to fracture and disintegrate. The refractory properties of a good fire-clay, its treatment in the manufacture and its use, in bricks and lumps, and the point at which it is necessary to substitute a silica material, are now sufficiently understood, and can be dealt with by any manufacturer having suitable fire-clay at his command, if purchasers are prepared to pay a reasonable price for their goods. Retorts, however, are on an entirely different footing. It is impossible to test them in the way that ordinary fire-bricks and lumps are tested. Chemical research is useful only to a limited extent; and physical properties, which undoubtedly play a most important part, can only be tested under ordinary working conditions.

Now, Sir, it may be asked how many engineers have encouraged experiments, or even allowed manufacturers to make them, except under conditions that were prohibitive; indeed, I would further ask how many there are who are prepared to pay the extra price for special selection of clay and care in manufacture. Two of the most eminent engineers in the country have told me at different times that "price is no object if we can get better retorts;" and in each case the lowest tender was accepted for their next contracts. Only when the Germans offer a foreign article are they prepared to pay more.

To-day retorts are subjected to much more severe conditions than they were only a few years ago. Their size, the higher heats employed, the introduction of mechanical charging and drawing or pushing, are all matters of importance; and in comparing the life of one set of retorts with another, there are so many varying conditions that it is quite easy to draw wrong conclusions. But I very much question if the retorts of forty or fifty years ago would have met present requirements so well as those manufactured to-day.

Does it not, then, come to this—that it is by the co-operation of retort manufacturers and gas engineers that the best results can be obtained? There are other matters besides the making of retorts—such as using various kinds of bricks in one setting, the rigid bracing of the ends of horizontal beds of through retorts, the use of inferior fire-clay in setting good quality bricks, &c.—which do not lie entirely at the door of the manufacturer, but which are all matters of importance to both makers and users; and if Mr. Bywater's paper should result in bringing them closer together, he will have earned the thanks of the trade, and he will, I hope, have an opportunity of learning that they are not so ignorant of their business as he imagines.

July 4, 1908. MANUFACTURER.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill brought from the Commons, read the first time, and referred to the Examiners: South-West Suburban Water Bill.

Bills reported: Bromley and Crays Gas Bill, Bury and District Joint Water Board Bill, Gas Orders Confirmation Bill, Gas and Water Orders Confirmation Bill, Garw and Ogmore Gas Bill, Glyncorrwg Urban District Council Bill, Rhymney and Aber Valleys Gas and Water Bill, Southwell District Gas Bill, Stockport Corporation Bill, Swinton and Mexborough Gas Bill.

Bills read the third time and passed: Ammanford Urban District Council Water Bill, Bromley and Crays Gas Bill, Bury and District Joint Water Board Bill, Leicester Corporation Bill, Southwell District Gas Bill, Stockport Corporation Bill.

The Burnley Corporation Bill and the Manchester Corporation Bill have been referred to a Select Committee, consisting of Viscount Hutchinson (Chairman), the Earl of Stradbroke, Lord Dunboyne, Lord Elphinstone, and Lord Hindlip; to commence sitting to-day.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill brought from the Lords, read the first time, and referred to the Examiners: Ammanford Urban District Council Water Bill.

Bills reported: Holderness Water Bill, Pontypridd Water Bill [Lords].

Lords Bills read a second time and committed: Keighley Corporation Bill, Ravensthorpe Urban District Council Bill.

Bills read the third time and passed: Audenshaw Urban District Council Bill [Lords], Blackburn Corporation Bill, Tawe Valley Gas Bill [Lords].

ELECTRIC CURRENTS AND GAS-MAINS.

On Monday last week, when the clauses of the London and District Electricity Supply Bill were under consideration by a Committee of the House of Lords presided over by the Earl of Cromer, the following amendment was submitted by Mr. Neville on behalf of the Brentford Gas Company: "The Company shall make full compensation to the Brentford Gas Company for any injury or damage to any gas main, pipe, or any works of the Gas Company which shall have been proved to have been caused by, or to have resulted from, any currents of electricity generated by the Company." Counsel explained that the amendment would give the Company the protection which they considered they did not possess under the existing regulations. It was urged by Mr. Talbot, K.C., for the promoters, that the proposal was based upon an entire misapprehension, as in the Company's case there would be no earth-return, and consequently no danger. The Committee rejected the amendment.

Mr. Neville then submitted the following amendment: "The Company shall efficiently ventilate any street-box provided by them, and efficiently insulate and keep insulated any electrical cables, mains, and wires laid through, or connected with, such boxes, under and for the purposes of this Act, so as to prevent the accumulation and explosion of gas therein, and shall free from and relieve the Gas Company from all damages and costs in respect of any explosion happening through defective ventilation or insulation of any such street-boxes, cables, mains, or wires." Mr. Talbot stated that every point brought forward had been fully dealt with in the General Acts. The amendment was accordingly rejected.

The Stretford Gas Company are conducting a gas exhibition in the Town Hall there, with free lectures daily by Mrs. Thomas, of Liverpool, on the advantages of cooking by gas. The exhibits include the "Telephos" lighting and extinguishing system, which has been described in the "JOURNAL." A similar exhibition has been held at Sale; and one is being arranged for at Urmston, which is also in the Company's area.

MISCELLANEOUS NEWS.

MR. HENRY HACK'S REMINISCENCES.

Under the title of "I Remember," the "Birmingham Gazette" on Monday of last week published the first of two articles by Mr. Henry Hack, M.Inst.C.E., on "Gas Lighting under Company and Corporation in Birmingham." The article was as follows.

Starting this chapter of reminiscences with the time that my long connection with the Birmingham Gas-Works commenced, I would say that it was in the autumn of 1871 that I had a letter from Mr. Hugh Young, who was Engineer of the then Birmingham and Staffordshire Gas Company, and whom I had known for several years. This communication was to the effect that he had decided to offer me the post of "General Assistant" to himself; his Directors being determined that it was desirable that such an officer should be appointed. Being desirous at the time of settling down in one place, I gladly accepted the proposal to visit Birmingham and meet the Directors of the Company. In due course, I appeared before them at the Gas Offices in Old Square—the site is now occupied by Newburys, Limited. The Chairman of the Company was the late Mr. Sharpe, of Endwood Court, Handsworth. After sundry questions, Mr. Sharpe informed me that the Engineer, Mr. Young, had spoken so highly of me that they were unanimous in appointing me to the post. Among other things that had been said in my favour, it was remarked, was the fact of my being an early riser. This had been noticed when I was carrying out work for Mr. Young in former years. He knew that whenever important work had to be taken in hand at an early hour, Sundays or week-days, I was one of the first to arrive, and I remained on the spot until the job was completed—a practice I subsequently adhered to, with satisfactory results.

Now, when I first came here there existed two Companies for gas supply. One was known as the Birmingham Gas Company, of which Mr. Edward White was the Engineer; the other was the Birmingham and Staffordshire Gaslight Company, of which Mr. Hugh Young was the Engineer. The former Company had two works—one at Windsor Street and one at Fazeley Street—their area of supply being limited to the borough of Birmingham. The Birmingham and Staffordshire Company were possessed of three manufacturing stations—Saltley, Adderley Street, and Swan Village; the latter having been built in 1825. Of the original elevation of this station, I may mention, an interesting photograph was taken a few years ago from an old meter-badge which was found on a scrap heap of old meters. This Company supplied gas not only in competition with the other Company in the Birmingham area, but also in many of the Local Authorities' districts outside Birmingham; these altogether forming a vast area to cope with. It was not long after my arrival in Birmingham that matters went wrong with the old Company. Defalcations to a large extent were discovered; and results being deemed not up to date, important changes were made in the administration, and also in the engineering departments. Mr. Charles Hunt, from the "London" Company's works at Nine Elms, was appointed Engineer in place of Mr. White.

The first extensions which I had to undertake under Mr. Young in connection with the Staffordshire Company were at the Saltley and Swan Village works—a new retort-house being built at each place; and at both the requisite and proportionate additions and alterations to the condensing, pumping, and other plant had to be effected. The retort-house was erected upon part of the gas land occupied by the tar-works adjoining Saltley Viaduct. The tar-works belonged to some of the Directors of the Gas Company; and during the construction of the retort-house these works were abandoned, and the tar sold by contract to distillers in the Black Country. The next extension of importance was to the storage capacity. It consisted of a tank and a double-lift gasholder of 1¼ million cubic feet. These extensions sufficed for the Company until the gas undertakings were purchased by the Birmingham Corporation.

This brings me to the beginning of a new era in the history of the lighting of Birmingham. It was about 1874 when Mr. Joseph Chamberlain, who was Mayor at the time, opened negotiations for acquiring the undertakings of the two Gas Companies and that of the Water Company. Things had so far gone smoothly with the Staffordshire Company, when just at this moment a cloud arose. At that time it required about £28,000 half yearly to pay the statutory dividends which had been forthcoming for years; and it was this fact that Mr. Chamberlain had to face in his negotiations with the Directors, who required the full value of the earning power of the Company. Unfortunately, there came about this time practically a coal famine, prices for gas coal being doubled, which resulted in the profits of the Company for the next half year falling to about £1200 only towards the £28,000 odd required. This caused great consternation, not only among the Directors, but also the negotiators for purchase; and while up to then nothing but praise was heaped upon Mr. Young, the Directors now came to the conclusion that he was largely responsible for the bad results of that notable half year, through having made bad bargains in the purchase of coal and the sale of coke and residuals. The Directors became apprehensive that such disastrous results might cause Mr. Chamberlain to reflect, and thus result in the negotiations for purchase being brought to an untimely end. As to what subsequently took place between Mr. Young and the Directors, I only know that the misfortune brought about Mr. Young's resignation of the post of Engineer. The Directors came to see me at Saltley, and asked if I would take charge of that station, to which I replied that I would do so temporarily; but I had counted upon succeeding Mr. Young in due course. It was then arranged that the Superintendents of Adderley Street and Swan Village, together with myself, should, at all events for a time, attend the Works Committee meetings. This arrangement continued for some months, but was ended by the Directors appointing me Engineer, as, besides other points, they felt they must have a head of the Engineering Department.

The financial results of the half year following the bad period were so satisfactory that the negotiations for purchase were continued, and at last completed. I would mention, by way of parenthesis, that part of this financial success was jocularly attributed by consumers to my having adopted a practice of sitting on the station governors during the hours of darkness, whereby an excessive pressure was given over the area of supply, causing their meters to spin round at an undue rate. I was able to smile at such a notion. It was in the autumn of 1874 that Bills were lodged by the Corporation to purchase the gas and water undertakings; and these Bills came before a Parliamentary Committee early in the session of 1875, when I gave evidence in detail in reference to the Staffordshire Company's undertaking. The Gas Bill was strongly opposed by some of the outside authorities, who objected to take their gas supply from Birmingham; but, after a long and strenuous fight, the Bill was passed by both Houses, subject to a clause being inserted that these outside authorities might apply, if they chose, within two years to purchase that part of the Staffordshire undertaking within their own area, and that Birmingham should offer no opposition. With regard to this clause, four of the outside authorities—West Bromwich, Smethwick, Oldbury, and Tipton—did apply to Parliament within the stipulated time, and obtained the powers they required to supply gas, also the distributing plant, in their own districts, upon terms to be settled by arbitration.

The first case put to arbitration was to settle the principle of purchase for all four of the outsiders; and West Bromwich was chosen as being the largest of them. The inquiry was held at the Surveyors' Institute, Westminster; the late Mr. Thomas Hawksley, M.Inst.C.E., being appointed the Arbitrator for Birmingham, and Sir Frederick Bramwell, M.Inst.C.E., for the Local Authority, with Sir Henry Arthur Hunt, as Umpire. Birmingham took up the position that the value to them was that upon profits made at the Swan Village works, whence the four districts obtained their supply of gas. The local authorities put forward the plea that they only had to pay back to Birmingham what it had paid for each of the areas concerned; £1 for £1, subject to a few adjustments for local conditions and circumstances. This first arbitration took up a total of 25 days, in broken periods, on many of which I had to give evidence for the Corporation. The remaining three cases took but a few days, as the West Bromwich case determined the principle of valuation for all of them. Some time elapsed before the award was given, by which the view of the local authorities was adopted; and this award being appealed against by Birmingham, it was upheld by the High Court of Justice. All this is historical, but perhaps interesting to the present generation of ratepayers. The purchase of the Staffordshire undertaking was, by the way, arranged upon the basis of perpetual annuities equal to the statutory dividends, upon the security of the rates, and certain other terms. The acquisition of the undertaking of the old Gas Company was by a lump sum payment in cash.

On Friday, the second article was published; and it is reproduced below.

In the autumn of 1875, the first Gas Committee of the Birmingham Corporation was formed, with Mr. Chamberlain, the Mayor, as Chairman; and from then until Jan. 1, 1876 (the legal date for taking over the concerns), the Committee arranged with the Directors to manage them upon mutual terms. In the interval, the future arrangements for carrying on the business were considered; and as regards the engineering branch, Mr. Charles Hunt, who had been Engineer to the old Company, was taken over by the Corporation, and myself also, as Engineer of the Staffordshire Company—the appointments being made upon the same footing, independent of each other as far as the works and duties entrusted to us. To equalize the duties under the altered circumstances, I gave up control of the Adderley Street works to Mr. Hunt—retaining the control of the Saltley and Swan Village works. This, with the small Fazeley Street works, which, being out of date and unprofitable to work, were soon abandoned, left Mr. Hunt with Windsor Street, besides Adderley Street. There were necessarily a great many mains in duplicate in the Birmingham area at the time of the transfer; and Mr. Hunt was entrusted with the making of the desired alterations and re-arrangement of them to suit the new conditions. He was subsequently authorized to take over the control of all the distributing apparatus of supply from the Birmingham works; leaving to me the control of all relating to the supply from the Swan Village works. To meet the possible future demands of the united undertaking, it was decided that the first extension of works under the Corporation Committee should take place at Saltley.

The new works to my designs comprised the doubling of the capacity of each of the gasholders there by adding a second lift; and by this means an extra 2 million cubic feet of storage was gained, at, though risky work, a comparatively low cost per 1000 cubic feet of extra capacity obtained. The accomplishment of these works practically filled up all the available ground at the Saltley station, and raised the productive capacity of the works from 5 million cubic feet at the transfer to over 10 million cubic feet. Having filled up the land at the Saltley works, the question naturally arose as to what was the next move possible to meet the ever-increasing consumption of gas. The Corporation having bought the land adjoining Saltley, which had been arranged for by the old Company before any purchase of the undertakings was thought of, the storage capacity for Saltley was brought up to the proper proportions by adding another tank and gasholder, of 2 million cubic feet capacity, on the land; and, as my hands were full at Saltley, Mr. Hunt was authorized to carry out this extension. But the Gas Committee, though new to their great responsibilities, were alive to them; and knowing the difficulty of obtaining land for manufactures of any description in or near Birmingham—particularly for gas-works—promptly availed themselves of an opportunity which soon came along to secure a large tract of land then known as Primrose Hill, adjoining the Windsor Street works, with the view of an early reconstruction and enlargement there.

The hour for going on with this scheme came earlier than was expected, owing to the rapid growth of the area of supply, and the great increase in the yearly, and even weekly, consumption of gas. It was then that Mr. Hunt's great plan of reconstruction was adopted by the Committee, commenced in 1879, and successfully completed in time to meet the still growing demand. Up to 1879, there were but two gas

holders at Swan Village, of a total capacity of only 1½ million cubic feet; and as that at Jervoise Street leaked badly, and caused litigation in reference to polluting wells in the neighbourhood, it was, upon my recommendation, abandoned, and a new tank and telescopic holder for 2 million cubic feet of gas were erected on land adjoining the Great Western Railway. The work was begun in 1879 and completed early in 1881; and it rectified the deficiency of storage previously existing at that station.

It may be welcome here to recall that, since Birmingham took over the undertakings, apart from extensions to meet the vastly growing demands, the department has in no way lagged behind in matters of improvement and economies in connection with the manufacture, purifying, and distribution of gas. Much of the old plant has been altered and brought up to date. Direct coke firing has been superseded by gaseous firing upon the regenerative principle, whereby a large amount of fuel and labour is saved, with much better temperatures and better control of them obtained. Hand labour for charging and drawing retorts and removal of coke has all been superseded by drawing and charging machinery worked either by compressed air or by hydraulic power. Systems of coke-conveyors worked by gas-engines, aided by the large hydraulic cranes for raising the coke to stacks and screening plant, such as are to be seen from Saltley Viaduct, make the works of a comprehensive and thoroughly up-to-date character. The past work has also comprised the laying of new trunk mains from the works and the enlargement of others in the districts for equalizing, improving, and maintaining in a satisfactory condition the gas supply at all points.

But the principal work of construction which has engaged the bulk of my time and attention for the past eight or nine years has been the designing and carrying out of new complete gas-works at Nechells. These are for the manufacture of 10 to 11 million cubic feet of coal gas a day, with inclined retorts, and a carburetted water-gas plant, for a nominal further daily make of about 6 million cubic feet. The old hand-charged retort-houses at Saltley have also been demolished and reconstructed on the inclined-retort system; and a carburetted water-gas plant has further been installed at the Swan Village works. In connection with the new works at Nechells, the course of the River Rea had to be brought back to its original width by building to my designs strong, composite retaining walls on both sides, of brick and concrete; and it will be remembered that at the same time the late City Surveyor (Mr. Price) took the opportunity of building at the back of one of these walls a new and enlarged outfall sewer to the sewage works. Included in the plant erected at Nechells, I may mention, was the addition of two lifts to the No. 5 double-lift gasholder—thus increasing its capacity from 2 to 4 million cubic feet. An entirely new tank and four-lift gasholder, of a capacity of 8¼ million cubic feet, were also constructed—the latter being at that time the second largest gasholder in the world. The top lifts of this and of the No. 5 holder were made to "run out" above the framing—a plan first adopted by Sir George Livesey at the South Metropolitan Gas-Works.

As showing the growth of the Birmingham gas undertaking since its acquisition by the Corporation in 1875, I would note that the actual increase is over 200 per cent. in the 32 years. It may well be asked in this connection how it is that the prophesied requirements, as stated when the Birches Green site was under discussion, have not been realized. The simple answer is that circumstances and conditions have materially changed since then. First of all, the costly Adderley Street manufacturing station has been retained instead of abandoned, as was intended under the Birches Green scheme; secondly, electric light is an increasing competitor, not only in Birmingham, but in the out-districts too; thirdly, consumption is reduced by the growing use of the incandescent mantle system, whereby less gas is required for a given lighting power; and, lastly, there is 15 per cent. greater yield of gas per ton of coal used, owing to the purchase of a greater quantity of the best gas-producing coals than before, and other circumstances.

I would here remark that my appointment under Mr. Young in 1872 was not my first acquaintance with Birmingham, as I had previously served on the engineering staff of the eminent firm of Messrs. John Aird and Sons, for whom I carried out many public works in the way of gas, water, and docks undertakings. Besides superintending the first section of the Gaslight and Coke Company's works at North Woolwich—subsequently known as Beckton, after the name of the then Governor, Mr. Beck—I carried out extensions at the European Gas-Works at Boulogne-sur-Mer and Rouen, also at the gas-works of Stafford, Kidderminster, and Birmingham—at Swan Village, Windsor Street, and Saltley—and also constructed the Aston reservoir under the late Mr. J. W. Gray. At about the same time, I laid a 36-inch main from Saltley Gas-Works to Spring Hill. It ran along Farm Street, and still exists, and remains the largest sized gas-main in the Birmingham area of supply.

Altogether, I have been acquainted with Birmingham some forty years. During this time, I have had the satisfaction of seeing able men promoted from Birmingham to other gas-works, several of them my pupils, in whose careers I have a personal interest. Among these I would recall Mr. S. Y. Shoubridge, now with the South Suburban Gas Company; Mr. S. Meunier, at Stockport; Mr. E. A. Harman, at Huddersfield; Mr. Philip Hunt, at Melbourne; Mr. J. W. Morrison, at Sheffield; Mr. T. H. Hack, at Swan Village; Mr. F. J. Bywater, Works Engineer at Saltley; Mr. Redfern; and Mr. Kenneth Aird.

I cannot leave the scene of these life-long activities without acknowledging the willing and able assistance given by one and all of the numerous staff associated with the engineering works, for without it no man could have accomplished the duties of Engineer-in-Chief in a satisfactory manner; and in withdrawing from the "old concern," whose interests I shall always have at heart, I can only hope that its wonderful success will be maintained, though I am very sceptical as to the prospects of the new arrangements made by the Committee for carrying on in future the engineering duties. My recommendation to them was to appoint a successor to myself.

Many changes have taken place in the chairmanship and membership of the Gas Committee since my appointment. Following Mr. Chamberlain came, in order of mention, Messrs. Marris, Kenrick, W. J. Hart, H. J. Lloyd, Maurice Pollack, C. T. Bishop, Hallewell Rogers, C. T. Bishop, followed by Sir Hallewell Rogers, on the completion of his Lord Mayoralty, who now so ably presides over the destinies of the department.

TRAINING LADS AS GAS-FITTERS.

Important Combination between the Gaslight and Coke Company and the London County Council.

At the Meeting of the London County Council last Tuesday, the following report by the Education Committee, giving particulars of a scheme arranged by them with the Gaslight and Coke Company for the training of lads as gas-fitters, was submitted.

The Directors of the Gaslight and Coke Company have had under consideration a scheme for the training and education of lads, not less than fourteen years of age, to enter their service as gas-fitters; and they have submitted it for the approval of the Council.

The Company propose that they should provide a workshop fitted with the plant and apparatus required for demonstrations and practical work, and also provide the necessary instruction; and that the Council should provide instruction, preferably at the Westminster Technical Institute, on two or three afternoons a week, in mechanical drawing, workshop arithmetic, composition, and précis writing. After a year in the workshops, the boys would go out with the gas-fitters, but continue to attend the Technical Institute on two or three half-days a week.

The Company ask for the assistance of the Council in recommending suitable boys for them to choose from for the training, which it is proposed shall cover a period of two years commencing in September. They would take 24 boys for the first year and 48 in subsequent years, as they expect to find regular employment for 24 a year, though permanent employment could not be guaranteed by them. The Company are prepared to pay the boys at least 2s. 6d. a week from the beginning of the course of training. The Company, however, reserve to themselves the right to discharge any lad they find unsatisfactory, and to place in the training-shop lads other than those recommended by the Council.

In the second year of their training, the boys may expect to receive about 10s. a week. After they have passed through the course of training, they would probably become fitters' mates, earning from 3s. to 4s. a day. If satisfactory, they would later on become fitters, receiving 5s. to 7s. a day. The next step would be to that of foreman, for which the pay is 8s. or 9s. Foremen have opportunities of promotion to assistant inspectors at £150 a year, and ultimately to inspectors at £200 a year. There would therefore appear to be a very good opening for a capable boy from an elementary school.

We submit the following statement of the extra staff required at the Westminster Technical Institute to give such instruction on three afternoons a week from 3 p.m. to 5.30 or 6 p.m., together with a statement of cost, in the present and subsequent financial years—

(1) *Cost for Year* 1908-9 *for* 40 *Weeks' Course, Commencing in September,* 1908.

One teacher of workshop arithmetic, mechanical drawing, &c., three afternoons a week, at 10s. 6d. an attendance	£63 0 0
One teacher of English, one afternoon of 1½ hours a week, at 10s. 6d. an afternoon	21 0 0
Materials	12 10 0
Drawing instruments	10 10 0
Text books	7 10 0
Sundries	5 0 0
Total	£119 10 0

For the present, arrangements could probably be made for the instruction in English to be given by a teacher who gives similar instruction in other of the Council's technical day schools; thus reducing the cost by £20. In the course of a year or two, it is expected that there will be sufficient day teaching in English at the L.C.C. Central School of Arts and Crafts to keep this teacher fully employed, in which case a special teacher of English would have to be engaged at Westminster. The Board of Education grant may be estimated at £2 a head for 24 boys—£48. The net cost for the first year would therefore be about £51 10s., or about £2 3s. a boy. The present staff of the Institute would be able to give any instruction in elementary mechanics or physics and chemistry, whichever might be considered desirable.

(2) *Cost for Year* 1909-10 *and Subsequent Years.*

During the second year of the course, a teacher of workshop arithmetic and mechanical drawing will be required for part time for the ordinary evening class of the Institute, and the remaining part of his time could be given to the classes for gas-fitters. It is therefore suggested that a whole-time teacher, at a salary of £160 a year, should be engaged. The cost for the classes for gas-fitters for the second year of the course (1909-10) and for subsequent years would therefore be—

One-half salary of full-time teacher at £160 a year	£80 0 0
One teacher of English for one afternoon a week of about four hours, at 15s. an afternoon	30 0 0
Materials	22 0 0
Text-books	7 10 0
Sundries	5 0 0
Total	£144 10 0

Arrangements might possibly be made for the English instruction to be given as in the first year. The cost in the second year could therefore be reduced by £30. The Board of Education grant is estimated at £96, or £2 a head for 48 boys. The net cost for the second and subsequent years would therefore be £18 10s., or about 7s. 6d. a boy. The Principal of the Institute suggests that the boys should pass through the course conditionally upon their attending evening classes for a third year for the study of specialized subjects.

In submitting this report, we desire to point out that the proposal of the Gaslight and Coke Company constitutes a very important departure in the direction of an association between employers and the Council's schools. A somewhat similar proposal, dealing with older students, has been made by the South Metropolitan Gas Company in the form of a request that classes may be provided for their employees

in the chemistry and technology of gas making—a subject which it will be possible to deal with very thoroughly in the proposed new Technical Institute for South-East London, but which can be dealt with for the present in the evening classes of the Goldsmiths' College.

The action of the Gaslight and Coke Company differs from that of the firms of silversmiths who approached the late Technical Education Board with a request for the establishment of apprentices' classes in silversmiths' work on Saturday mornings, inasmuch as the Gas Company are asking the Council to supplement the workshop instruction which they propose to give to their apprentices by instruction in elementary science and in other subjects bearing upon the occupation of the boys. In this respect, the Gas Company have followed the lead of the War Department in the arrangements which they have made for the training of the Arsenal apprentices in the Woolwich Polytechnic; but the present is, we think, the first case in which a commercial company has taken this action in respect of the training of junior apprentices. There have been many other cases in which persons interested in particular trades have asked the Council to assist in the purely technical training of their employees.

It would be exceedingly helpful if the larger employers in London could be brought into touch with the public elementary schools, through the managers or otherwise, in such a way that the employers would express their willingness to take, on the average, so many boys from a particular school conditionally upon the boys attaining a certain standard in their ordinary school subjects, and, further, on condition that the boys, after starting on their apprenticeship, continued their education by attending classes provided in continuation schools of the Council at certain times when the employers would undertake to allow the boys freedom to attend. Co-operation of this kind between the schools and the employers would be of untold advantage to the boys, and would greatly conduce to the interests of the employers by raising the efficiency of the workers; while it would probably go far to prevent a large number of boys sinking into the ranks of the unemployed.

In accordance with the Standing Orders, we have informed the Finance Committee of these proposals. We recommend—

(*a*) That the Council do undertake to recommend 24 suitable boys, not less than fourteen years of age, for the two years' course of training in the Gaslight and Coke Company's workshops, commencing in September, 1908; to provide instruction for such boys in workshop arithmetic, mechanical drawing and sketching, English composition, and elementary mechanics (or physics and chemistry), on three afternoons a week at the L.C.C. Westminster Technical Institute from 3 p.m. to 6 p.m., subject to the boys taking a third year's course in specialized subjects at evening classes; and to agree to the right of the Company to discharge any lad they find unsatisfactory, and to place any lad in the training-shop not recommended to them by the Council; and that the Gaslight and Coke Company be so informed.

(*b*) That the employment be authorized at the L.C.C. Westminster Technical Institute of a teacher of workshop arithmetic and mechanical drawing for three afternoons a week, at 10s. 6d. an attendance; and that equipment and materials be supplied at a cost of £35 10s.

On the report coming up, the Chairman of the Committee (Mr. Cyril Jackson) obtained leave to alter the words introducing the recommendations, so as to read that provision had been made in the annual maintenance votes for carrying out the scheme; and to insert the words "not exceeding" before the figures at the end of the second recommendation. As amended in this way, the report and recommendations were adopted.

What the South Metropolitan Company are Doing.

The adoption of the foregoing recommendations by the County Council led a representative of the "Daily News" to interview Sir George Livesey on the subject on Wednesday. In the course of conversation, Sir George described the efforts made by the South Metropolitan Gas Company to promote technical education among their own employees. Last year, for instance, the company engaged a special lecturer to give a course of lectures on "Gas Distribution—From the Works to the Burner;" and they were attended by a large number of men of all grades. Thirty of the men sat for an examination, and more than two-thirds of them passed. This year the Goldsmiths' Institute had taken over the work which the Company began. Sir George expressed his warm approval of the technical education of workmen. "In the nature of things," he said, "it makes more intelligent workmen. Take our own men. How many of them would, in the ordinary way, understand anything about the principle of the incandescent burner? The men are only too anxious to learn. In attending the classes, they gave their time and paid their own fares; there was no special reward. As for taking boys, we are doing much the same kind of work as that described in the London County Council's report, but not through the Council. We take the sons of our own workmen; and as we have about 7000 men, there is, as you can imagine, no scarcity of boys. We are, however, so hampered by the Factory Acts in trifling matters that we do not employ many boys in the works, but have to employ them about the district. It appears to me that much legislation that is directed against bad employers seriously hampers good employers, and often does more harm than good."

Extensions at the Wigan Gas-Works.—At the meeting of the Wigan Corporation last Wednesday, a letter was read from the Local Government Board, sanctioning the borrowing, in connection with the gas undertaking, of £10,500 for mains and services, £10,000 for meters, and £1750 for additional purifiers.

Cheaper Public Gas Lighting at Oxford.—The General Purposes Committee reported to the Oxford City Council at their last meeting that the contracts with the Oxford Gas Company and the Oxford Electric Company had expired; and they recommended the renewal thereof. The contract with the Gas Company was to be subject to determination upon twelve months' notice from either party on March 31 in any year. Owing to certain alterations and a reduction in the Gas Company's charges, the Corporation would effect a yearly saving of £435 on this contract. The contract with the Electricity Company was to be on the same terms as before, and to be determinable as in the case of the Gas Company. The recommendation was agreed to.

THE DAYLIGHT-SAVING BILL.

Text of the Committee's Report.

In accordance with the intimation contained in the last number of the "JOURNAL," the Committee on the Daylight-Saving Bill met on the 30th ult., and agreed to their report, as follows.

1.—The Committee have met and considered the Bill, and have examined numerous witnesses, records, and papers, and have directed the Bill to be reported to the House, with amendments. They have also directed the minutes of evidence, with an appendix, to be laid before the House.

2.—The Committee find that the Bill proposes the adoption of a local time in advance of Greenwich mean time in the case of Great Britain, and in advance of Dublin mean time in the case of Ireland, during the summer months—viz., from April to September in each year—with the object of promoting the earlier and more extended use and enjoyment of daylight during those months; that such object is desirable, and would benefit the community, if it can be generally attained; and that the weight of the evidence submitted to the Committee agrees with and supports this view, though there was divergence of opinion as to the best mode of accomplishing it.

3.—The paramount advantage the Committee find to be the greater use of daylight during the months named. The effect of the proposals of the Bill would be: (1) To move the usual hours of work and leisure nearer to sunrise. (2) To promote the greater use of daylight for recreative purposes of all kinds. (3) To lessen the use of licensed houses. (4) To facilitate the training of the Territorial Forces. (5) To benefit the physique, general health, and welfare of all classes of the community. (6) To reduce the industrial, commercial, and domestic expenditure on artificial light.

4.—The principle of the Bill has been supported by the Chambers of Commerce in London, Liverpool, Manchester, Bristol, Sheffield, and other towns, and by the Borough Councils of Glasgow, Huddersfield, Bournemouth, Hackney, Llandudno, and other places; by the London and North-Western, London and South-Western, and Great Central Railway Companies, and by the Great Eastern Railway Company, except as to Continental traffic, which on that railway is a little over ½ per cent. of the passenger traffic and not more than 5 per cent. of the goods traffic; by many representatives of the manufacturing, commercial, and shopkeeping classes; by the Secretary of the General Federation of Trade Unions, comprising 700,000 members; by numerous associations for recreative purposes; and by schoolmasters and others interested in the education and welfare of children. Evidence has been submitted showing the reception of the Bill by the Press, of which by far the largest proportion is favourable. The Post Office, represented by Sir Henry Babington Smith, K.C.B., agreed that the postal business in the United Kingdom and with the Colonies and United States could be easily accommodated to the proposals of the Bill, but that some difficulties would arise with regard to European postal business; and he stated that the total letters and other postal articles dealt with every week averaged 48 millions, of which less than 6 millions are continental and foreign.

5.—Papers have been submitted showing numerous statutes, rules, regulations, and bye-laws which contain reference to clock-time.

6.—The Committee have invited objections to the proposals contained in the Bill, and such as have been made appear in the evidence, and may be summarized as follows: (*a*) Objections to the Bill altogether, or (*b*) to the particular proposals.

(*a*) As to the objections that the Bill is unnecessary or undesirable, the Committee agree that the objects proposed cannot be attained without legislation; that a single Act establishing local time for the United Kingdom of Great Britain and Ireland is better than an Act severally altering all the times prescribed by various Acts, bye-laws, and other rules for the conduct of civil business; that the interference with European traffic will be inappreciable compared with the general benefit to the nation at large, and can be easily overcome; that the interference with American business can be obviated without serious dislocation or loss by the adherence of those concerned to their present hours when necessary; and that the various interests affected could, without much initial difficulty, adapt themselves to the alteration.

(*b*) As to objections to the particular proposals—viz., that the making of four alterations of 20 minutes each in April and four alterations of 20 minutes each in September would occasion undue public inconvenience and too much resulting interference with the ordinary measurement of time in those months by clocks and watches—the Committee considered the following proposals for obviating or minimizing these difficulties:

(1) Three alterations of 30 minutes each in April and three alterations of 30 minutes each in September; or (2) two alterations of 30 minutes each in April and two alterations of 30 minutes each in September; or (3) a single alteration of one hour in April and a single alteration of one hour in September; or (4) a permanent alteration of one hour, and so adopting Mid-European time.

7.—The Committee agree that this last proposal is eminently undesirable; and, for the sake of simplicity and general public convenience, they find that a single alteration of one hour in April and a similar alteration of one hour in September is the best mode of attaining the object of the Bill.

8.—The Committee recommend that these changes should take place at two o'clock in the morning—Greenwich mean time in the case of Great Britain, and Dublin mean time in the case of Ireland, on the third Sunday in April; and at two o'clock in the morning, Greenwich mean time in the case of Great Britain, and Dublin mean time in the case of Ireland, on the third Sunday in September of each year. The Committee amended the Bill accordingly.

9.—The Committee find there is no serious practical difficulty in adjusting clocks and watches to these seasonal changes. They consider that the Bill should be called the Local Time (Great Britain and Ireland) Bill. They also consider that no interference with Greenwich mean time should be attempted, and that for all scientific purposes, such as astronomy or navigation, Greenwich mean time should continue to be used as heretofore.

SULPHUR IN LONDON GAS.

A Report to the London County Council.

At to-morrow's meeting of the London County Council, the following report (headed "Gas-Testing—Sulphur in Gas") will be presented by the Public Control Committee.

We reported on May 26 [see "JOURNAL" for May 26, p. 512] that we had before us particulars of the quality of the gas supplied during the year 1907 by the Gaslight and Coke Company, the South Metropolitan Gas Company, and the Commercial Gas Company, which showed that the increase in the amount of sulphur present in the gas since the passing of the London Gas Act, 1905, was very noticeable. We stated that the average amount of sulphur in the gas supplied by each of the three Companies was above the limit of 35 grains per 100 cubic feet, which, it was stated by the Chairman of the South Metropolitan Gas Company, before the "Departmental Committee on Gas Testing in the Metropolis," would be the probable average amount of sulphur in the gas after the removal by the above-named Act of the restrictions requiring purification by means of lime; and, further, that the figure of 35 grains per 100 cubic feet was much higher than the limits of 17 and 22 grains originally laid down by the Metropolitan Gas Referees for summer and winter respectively.

In accordance with the terms of our report, we asked the Gas Companies for an explanation of the large proportion of sulphur compounds present in the gas supplied by them, and for an assurance that the proportion shall be reduced in future. We find, however, that, owing to a clerical error in compiling the figures, the amount of sulphur in the gas supplied by the Commercial Gas Company was incorrectly stated; and we are pleased to state that the average in the case of this Company is below the figure above referred to, of 35 grains per 100 cubic feet. These remarks do not apply, however, in the case of the other two Companies.

The Gaslight and Coke Company states that from time to time, when the sulphur in the gas supplied by the Company has exceeded the quantity which, having regard to the evidence given before the Departmental Committee, might be considered moderate, special instructions have been issued by the Company to its officers; and that since the passing of the London Gas Act, 1905, the Company has endeavoured to secure that its gas should be purified to the fullest possible extent, while, in the opinion of the Company, the relief to the public from the discontinuance of the use of lime for purification has without doubt been great. The Company points out that if it had not been compelled during the past year to vary its sources of supply of coal, the gas examiner's returns would probably not have elicited comment; and that the market having now resumed a nearly normal state, the Company is reverting to the use of coal of the customary descriptions. The Company, moreover, gives an assurance that continued efforts will be made to reduce the quantity of sulphur in the gas, although the Company is of opinion that none of its consumers have been prejudiced, and that many, on the other hand, have benefited by recent legislation.

The South Metropolitan Gas Company states that the evidence given by its Chairman before the Departmental Committee as to the amount of sulphur in gas was based upon the official testings made during certain years when lime was not used for purification; and that there was no reason to expect that the then average of 35 grains of sulphur in each 100 cubic feet would be exceeded, although that result has not yet been reached. The Company takes exception to the suggestion that the question seriously affects gas consumers generally, but adds that, notwithstanding this, it will spare no pains, either in its selection of coal or in its chemical investigations, to keep the amount of sulphur in the gas supplied as low as possible.

A GRATIFYING REPORT AT BELFAST.

The minutes of the Gas Committee submitted at last week's Meeting of the Belfast City Council stated that Sir Alexander Binnie had conferred with the members and officials regarding the gas-works extension.

Mr. J. A. Doran, in moving the adoption of the minutes, said he had a gratifying report to make in connection with the gas undertaking. The gross profit on manufacture and sale of gas and residuals for the past year was £53,211. Deducting interest and dividends on capital (£10,251), they had a net profit of £42,960, as against the previous year's £51,151, or a decrease of £8191. This decrease was more than accounted for by the increase in the price of coal, oil, and other materials. The balance brought forward from the previous account was £23,450. Adding to this the net profit of the past year, and the profit on stove repairs account (£78), they had a total of £66,488. Out of this amount the following sums had been set aside: Sinking fund, £5672; equivalent of interest on redeemed stock, £3019; interest on insurance suspense account, £641—total, £9332, leaving £57,156. They had also contributed the following amounts: In aid of rates, £20,000; dividends and sinking fund on new City Hall stock, £11,262; in aid of capital expenditure on new City Hall, £15,000; Baths and Lodging House Committee, £600—total, £46,862, leaving a balance at credit of profit and loss account of £10,294. It was pleasant to have such a good report; and great credit was due to the Manager, Mr. R. Sharpe, for the able manner in which he had conducted the undertaking.

The South Staffordshire makers of marked bars—the principal class of iron produced in the district—sent out circulars last Tuesday evening announcing a reduction of 10s. per ton in the price. This makes the new selling price £8. The drop has been expected, as all other descriptions of iron have for some time been declining in value. The last alteration took place in January, when there was a reduction of 10s. per ton; but previous to that date there had been no change since December, 1906, when an advance of 10s. was declared.

EDINBURGH AND LEITH GAS COMMISSIONERS.

The Annual Accounts.

As was stated shortly in the last number of the "JOURNAL," the accounts of the Edinburgh and Leith Gas Commission for the year from May 16, 1907, to May 15, 1908, were laid upon the table by the Treasurer (Mr. John S. Gibb) at a meeting of the Commissioners on the 29th ult.—Bailie BRYSON, of Leith, presiding. They will remain upon the table for a month, during which time they will be officially audited. Accompanying them was the following statement by the Treasurer:—

The balance carried to the profit and loss account on the year's working is		£103,007
There has been paid during the year—		
For Edinburgh and Leith annuities	£31,568	
,, Edinburgh-Portobello annuities	1,067	
,, Amount transferred to sinking fund in respect of annuities redeemed	2,565	
,, Do. in respect of mortgages redeemed	1,991	
,, Interest on mortgages, &c.	40,778	
,, Expenses of mortgages	1,631	
		79,600
Showing a net balance on the year's working of		£23,407
To this falls to be added the balance for the year to May 15, 1907 (after meeting the sinking funds contributions for that year)		912
Making the sum at the credit of the profit and loss account		£24,319

As compared with £22,884 for the previous year.

This is subject to the statutory minimum charges for the sinking funds, as follows:—

(1) For repayment of money borrowed (20s. per cent.)	£11,834	
(2) For redemption of annuities (15s. per cent.)	6,891	
(3) For reserve fund (Commissioners' Gas Order, 1902, sec. 9), ¼ per cent. on £463,248	1,158	
		19,883
Which leaves a balance of		£4,436

at the credit of the profit and loss account, to be carried forward to next year, or added to the reserve fund, as the Commissioners may determine.

Under the "Law Expenses" and "Accidental Damages" accounts, further provision has been made to meet the Commissioners' liability in the Brewery Well case.

The gas sold was 8 million cubic feet more than last year; and the revenue from gas is greater by £16,232. The return from residual products was also larger by £9536.

The present value of 1d. per 1000 cubic feet of gas is £7988 11s. 3d.

The stock capital has been reduced during the year by the redemption of annuities to the amount of £2585, and now stands at £341,934; the amount of annuities redeemed for the £2585 being £247. In the loan capital account, a very great change has been effected, in respect that £197,293 of money on deposit receipt, bearing interest at from 3 to 4 per cent., has been reduced to £6606, at 3¼ per cent. interest; and money borrowed on mortgage, which stands at £1,176,769, has been increased by £182,251. It is to be observed that while mortgages at 3 per cent. have decreased by £14,535, and at 3¼ per cent. by £194,433, mortgages at 3½ per cent. have increased by £391,219; showing that the Commissioners are now paying more for their money. Of the authorized sum of £1,400,000, the Commissioners still have power to borrow £136,752. There was no capital expenditure upon works in the past year; the sum now standing at £1,150,465—Granton being represented by an expenditure of £842,427. But £8040 of capital expenditure was incurred—£1712 on main and service pipes and cost of laying—a decrease of £3389; £4051 on meters, an increase of £2375; £1543 on heritable properties not embraced in the works; and £733 upon gas cooking and heating appliances, a decrease of £390. The capital account now stands, less deductions during the year to the amount of £4815, at £1,616,184; being a decrease of £3226. Since the Commissioners came into existence in 1888, sums amounting to £28,066 have been expended in the redemption of annuities.

In the revenue account, the total income is shown at £351,063, an increase of £25,841. Gas sold amounted to 1,939,361,700 cubic feet, an increase of 8,060,700 cubic feet; and the revenue from gas, £281,414, was an increase of £16,233, due to raising the price as from October last by 3d. per 1000 cubic feet. Coke realized £34,560, an increase of £9958; tar, £13,410, a decrease of £2; and sulphate of ammonia (less working expenses), £20,717, a decrease of £428. The quantity of coal carbonized was 175,620 tons; being a decrease of 2904 tons. The price paid was £123,016, or an increase of £19,016. For oil for carburetted water gas there was an expenditure of £4754, or an increase of £1954. Salaries, wages, and charges at works for general purposes amounted to £12,878, a decrease of £207; wages for carbonizing amounted to £12,166, a decrease of £121; purifying materials and wages of purifier men cost £836, a decrease of £1014; and repairs and maintenance of works and plant, tools and implements, and dismantling old works, cost £23,902, a decrease of £352. The total cost of manufacturing gas was £177,551, an increase of £19,273. In the distribution of gas, salaries and wages of rental clerks, inspectors, surveyors, and fitters amounted to £11,903, a decrease of £257; repairs and maintenance of pipes and attendance at gasholders cost £8636, an increase of £706; repairs and maintenance of meters £3660, a decrease of £745; and the proportion of repairing and fitting up gas-stoves £1123, a decrease of £95. The total charge for the distribution of gas was £25,322, or an increase of £386. Management cost £10,984, an increase of £331; feu-duties and rents amounted to £696, an increase of £97; and rates and taxes to £15,185, an increase of £667. Allowances to old employees and to representatives of deceased employees came to £1585, an increase of £44; accidental damages to £6559, an increase of £2789; law and parliamentary expenses to £2705, an increase of £914; and discounts and bad debts to £7467, an increase of £555.

The total expenditure was £248,056, an increase of £24,954. The balance carried to the profit and loss account is £103,007, an increase of £887. The sinking fund for the repayment of money borrowed amounts to £79,873, an increase of £22,456; and the sinking fund for the redemption of annuities to £143,079, an increase of £7384. The total invested sinking funds stand at £164,453, a decrease of £1317. The reserve fund, also invested in mortgages over heritable properties, amounts to £11,315, an increase of £3476.

In the gas-stove account, it is stated that the year began with stoves, &c., on hand of the value of £13,791, an increase of £1123. Stoves, &c., were purchased during the year of the value of £3289, an increase of £772; and the expenses of repairing and fitting up stoves amounted to £3266, a decrease of £208. The total outlay was £20,347, an increase of £1688. There was received for the hire of stoves £2644, an increase of £880; as the price of stoves, &c., sold, £1365, a decrease of £108; and for fitting up gas-fires, &c., £690, an increase of £87. The proportion of fittings charged to the revenue account, being 7½ per cent. on the value of stoves, &c., amounted to £1123, an increase of £95. The total revenue is stated at £5822, an increase of £954. The balance, being the value of stoves, &c., on hand or lent on hire at the 15th of May last, as per the capital account, is stated at £14,525, an increase of £734.

THREATENED STRIKE AT THE STOCKPORT GAS-WORKS.

At an unfortunate moment—in view of the special arrangements that were being made for illuminations in connection with the Royal visit to the borough—a dispute arose last week between the Stockport Gas Committee and the local branch of the Municipal Employees' Association. It is explained that recently Mr. John Hayes, the Secretary of the Stockport branch of the Association (a meter inspector in the employ of the Gas Committee), was dismissed; and the local branch of the Association allege that the real reason for the dismissal was Mr. Hayes's official connection with the organization. Last Thursday a deputation from the Association waited on the Committee, and asked for a definite statement as to the cause of the dismissal of Mr. Hayes; and the Chairman intimated that the Committee would require a week to consider the matter. This the deputation refused to agree to; and a mass meeting of the workers was held subsequently, at which it was decided that the District Secretary, Mr. J. T. Jones, should write to the Executive Committee of the Association with a view to withdrawing the men forthwith. It is stated that 90 per cent. of the Stockport gas workers are members of the Association.

In the course of an interview on Friday, Mr. Fernley, the Chairman of the Gas Committee, said that, in the event of a strike, there was no fear that the department would be unable to carry out its obligations with regard to the illuminations on the occasion of the Royal visit to-day (Tuesday). There would be an adequate supply of gas for the purposes required. With regard to the case of the dismissed official, he said the man was discharged by the unanimous decision of the Committee after a full and independent investigation, in which the man was given every opportunity of stating his case. With regard to the allegation that the official had been dismissed because he was the Secretary of the Stockport branch of the Municipal Employees' Association, the Committee were in entire ignorance of the position he held in the Association until after they had arrived at their decision.

Mr. Hayes, the dismissed official, stated that if the gas-workers came out on strike the tramway employees and the employees in the other Corporation departments who were members of the Association, would probably also hand in their notices. He believed his dismissal was due to the fact that he had taken some part in organizing the employees, so as to get better conditions for the meter inspectors.

LEIGH (ESSEX) GAS-WORKS EXTENSIONS.

The Scheme Approved.

After much controversy, and a town's meeting at which the scheme was approved, the Leigh-on-Sea Urban District Council have finally made up their minds to the expenditure of a sum of £3000 upon the extension of the gas-works.

At the meeting of the Council last Friday week, Mr. E. J. Meachen, the Chairman of the Gas Committee, pointed out that the ratepayers had passed a resolution urging the Council to go forward with the work; and he said the Committee now recommended that the plans and estimates of the Surveyor (Mr. J. W. Liversedge) be approved and adopted, and the work carried out as early as possible—the estimated cost being £3100. This, however, did not include a gasholder, which would bring the expense up to some £5500. He felt that they were quite justified in going forward, and predicted a reduction in the price of gas in the near future. He moved the adoption of the recommendation. The motion having been seconded, Mr. Higgins moved an amendment (for which, however, he was unsuccessful in finding a seconder) that the Council take their principal supply of gas from the Southend Gas Company, until it could be proved that the Council could supply gas at the same price as Southend. He said that the proposed erections would be a blot for ever on their coast-line; and for this reason he suggested that no more money should be spent on extending the present works, which would not pay unless they charged the public an exorbitant price for gas. The present charge of 4s. 6d. per 1000 feet was an outrageous price, and prevented would-be consumers from using gas. The contention that the works would eventually pay, was all surmise. He thought they would never pay under the present management. Last year he believed they manufactured 13 million cubic feet of gas, out of which 2 million cubic feet were unaccounted for. Where did the leakage go? Mr. Arnold expressed the opinion that it would not be very long before they would be able to considerably reduce the price of gas. If they did not go on with the proposed extensions, there was no alternative but to sell the undertaking, which was a valuable asset to Leigh. Mr. Grocott said that while he regretted that the present site was chosen for the works, he did not see how they could very well make any alteration in this respect. Though the ratepayers had formally approved of the scheme, it was only on the understanding that there would be a reduction in the price of gas in the future. Mr. Senior observed that the profit for last year was assumed to be £700; and he asked why this should not be used for the benefit of the ratepayers. He considered they should put their house in order before enlarging the present works. There was no immediate hurry to proceed with the work; and until they obtained more definite figures as to the position of the undertaking, they could continue to get their supply of gas from Southend. Mr. Grocott then moved, and Mr. Sandercock seconded, an amendment that the proposed extensions be approved, subject to the price of gas being reduced to 4s. per 1000 feet from Sept. 29 next. The Chairman (Mr. H. G. King) said while he had been on the Council the Gas Committee had done their very best for the town; and he could not understand why they should be continually hampered.

The amendment was lost, and the original motion was then agreed to.

ANNFIELD PLAIN AND DISTRICT GAS COMPANY.

The First General Meeting of this Company was held on Monday of last week, at the London Offices, No. 50, Cannon Street, E.C.—Mr. W. C. PARKINSON in the chair.

The SECRETARY (Mr. W. R. Pike) having read the notice convening the meeting,

The CHAIRMAN explained that as the Board had only just taken the concern over from the vendors, there were no accounts to be presented. The first balance-sheet would be made up to Dec. 31 next. The shareholders had been called together that day primarily for the purpose of holding the first meeting, as provided by the Annfield Plain and District Gas Act, 1907, which required that such meeting should be held within twelve months of the passing of the Act. It would also at this meeting be necessary to elect a Board of Directors, either by re-appointing those nominated in the Act or by electing others in their place. Since the passing of the Act, the Arbitrator had been appointed by the President of the Institution of Gas Engineers; the gentleman selected being Mr. Charles Hunt, who was well known in the gas profession, and who was last year President of the same Institution. In accordance with the provisions of the Act, Mr. Hunt gave his award after hearing the parties concerned; and he awarded to the vendors, Messrs. Schultz and Comins, as the cost price of the Kyo and Dipton works acquired by them, £9711 19s. 5d., and as the fair value of works executed £16,000. The vendors had been carrying on the works since March 31 last on behalf of the Company; and from that date the revenue would accrue to the Company. The returns from week to week from the works indicated that there was a large increase in the output of gas. There were now over 1000 consumers; whereas when the vendors took possession of the concern there were only 469 customers. The Directors were proceeding with the laying of certain further mains for the purpose of extending the operations of the Company; and new consumers were being connected every day. The Board had every reason to believe that the undertaking was in a thoroughly sound and satisfactory condition, and that the shareholders would soon be receiving the standard dividends provided for in the Act. While the proceedings were being conducted in the House of Lords, the Company purchased the small works at Burnopfield, on the borders of the Annfield Plain district; and these were now being carried on by the Company, with the intention of eventually connecting the mains with those at Dipton.

On the motion of Mr. H. C. WALKER, seconded by Mr. W. A. SCHULTZ, it was unanimously agreed that Messrs. Charles Comins, M. M. Hobson, W. C. Parkinson, W. A. Schultz, and H. C. Walker be elected Directors of the Company. Thereafter Messrs. Davies Bros. were appointed Auditors, on the proposition of Mr. CHARLES COMINS, seconded by Mr. WALKER. Moved by the CHAIRMAN, and seconded by Mr. SCHULTZ, it was next agreed that the question of fixing the remuneration of the Directors and Secretary should be deferred.

The CHAIRMAN said it was necessary that the Company should have some money for their capital and current accounts; and he therefore proposed that the Directors be authorized to raise on mortgage of the undertaking the sum of £9000 for a period of five years, on such terms and by such form of mortgage as the Board might approve.

Mr. WALKER seconded this; and it was agreed to.

In reply to a question, Mr. SCHULTZ stated that since March 31—the date at which the Company took over the works—185 new consumers had been connected. There were in hand orders for a great number of new connections, which were being executed as rapidly as possible.

It was agreed that in future the general meetings should be held in the month of February or March; and the proceedings concluded with a vote of thanks to the Chairman for presiding.

Stourbridge Water Purchase Proposal.—The Stourbridge Urban Council have been informed by their Clerk (Mr. W. W. Goddard) that in the Confirmation Bill in connection with the Stourbridge Water-Works Company's application to the Board of Trade for further borrowing powers, a purchase clause has been agreed upon entirely satisfactory to the representatives of the Joint Councils concerned in the matter.

Mechanical Filtration at Bolton Water-Works.—For some time the Bolton Corporation have had trouble with regard to the water supply from the Heaton reservoir filter-beds; and, with a view to remedy this, the Water Committee recently decided to adopt mechanical filtration, which has proved so successful at the Sweetloves reservoir. The system at present in operation at Heaton is by means of open sand filters. For the supply and fixing of the mechanical filters, the tender of Messrs. Bell Bros., of Ravensthorpe, has been accepted.

PUBLIC LIGHTING OF TUNBRIDGE WELLS.

Electricity Preferred to Cheaper Gas.

The question of public lighting was again before the Tunbridge Wells Town Council at their meeting last Wednesday, and led to a protracted discussion. The minutes of a special meeting of the Lighting Committee held the previous day stated that the following letter had been received by the Town Clerk (Mr. W. C. Cripps) from Mr. C. F. Catt, the Secretary of the Gas Company, and that the Committee had decided that the offer of the Company to light a minimum of 414 lamps at £3 12s. 6d. per lamp be accepted for a period of twelve calendar months from Dec. 24, 1908—the terms of the current contract being maintained in other respects.

> Your letters were carefully considered by the Directors of the Company; and in reply I am instructed to state that they regret they are unable to accept the recommendation of the Lighting Committee. The proposed reduction in the number of lamps would involve a serious loss of capital to this Company; and the upkeep of a smaller number of lamps in outlying parts and isolated positions would necessarily entail an increased cost; so that for 414 lamps the charge would be £3 12s. 6d. per lamp per annum.
>
> The Directors, however, being anxious to arrive at a definite settlement on the question of public lighting by gas, are prepared to reduce the charge to £2 17s. 6d. per lamp per annum for the existing lamps, for one year from Dec. 31 next, which represents an annual saving in public lighting of about £200. If the Lighting Committee will enter into a contract for three or more years, the Directors are prepared to further reduce the charge to £2 15s., representing an annual saving of about £270.
>
> The Directors desire me to state that this being a specially low offer, they trust the Lighting Committee will give the same the fullest consideration in the interests of the ratepayers, of whom this Company are the largest—paying the Corporation, as they did last year, the sum of £900.

Mr. Hicks said that, though a member of the Lighting Committee, he had for some years disagreed with his Committee upon the question of public lighting, which he believed should be in the hands of an independent Committee of the Town Council, instead of one Committee being both buyers and sellers. He deprecated the restoration of the control of street lighting to the Electricity Committee, which meant that the ratepayers were charged more for street lighting than they would be in open competition. He said emphatically that the Gas Company had never had fair play from the Committee, who had deliberately avoided open competition, however much that competition would be to the advantage of the ratepayers, whom the Committee were supposed to represent. He had protested, and should continue to protest, against the Lighting Committee paying themselves more than the Gas Company were prepared to tender at. The town should be lighted as cheaply and efficiently as possible; and no other interest than that of the ratepayers should be considered. The Committee could not supply light as cheaply as the Gas Company; and it was far better for them to devote their energies to earning 4½d. per unit from private consumers than 2d. per unit for public lighting, when that price was above what the Gas Company would charge. He was aware that it would be urged that the Electricity Committee wanted the street lighting, because of the load-factor; but there must come a point at which, even for the sake of the load-factor, the Electricity Committee could not afford to sell as cheaply as the Gas Company; and the ratepayers ought not to be deprived of the benefit of the cheaper tender. Instead of spending £10,000 on more plant, he would prefer to gradually reduce the street lighting, which was not profitable to the Committee, and use the existing plant to supply the private consumer, who was paying double the price. By all means let the ratepayers have the benefit of cheap gas lighting for the street-lamps, and let the Electricity Committee devote themselves to the private consumer. He felt so strongly that the ratepayers' interests were being ignored, that he should feel it his bounden duty to resign from the Lighting Committee. He regretted that, at the instance of the Mayor, the control of public lighting had been restored to the Committee, because it was obvious that the Committee could not tender as low as the Gas Company, and they preferred to accept a higher tender from themselves than a lower one from the Gas Company, which would have been a considerable saving of the ratepayers' money. The attitude of the Committee was that they would simply reject the Gas Company's offer, and not bother about the morality or the immorality of the transaction any more than they had bothered about the ratepayers' pockets. They would accept their own high tender, and reject the low one. It was said that the money would ultimately come back to the ratepayers; but if they were doing the work at a loss, this argument fell to the ground. They were not making a profit themselves; and they would not let the ratepayers have the benefit of a cheaper tender from the Gas Company. It was no business of theirs whether the Gas Company made a profit or not. But it was their business and duty to save the ratepayers' money when they could. The Gas Company, as they reduced the price of gas to the private consumer under the sliding-scale, had given the ratepayers the same reduction; but the Electricity Committee, being the buyers for the ratepayers, had never done so. The Gas Company had treated the ratepayers with an honesty and fairness which the Electricity Committee had never shown them. As to the argument of the number of street-lamps, the Gas Company, up to this year, were charging £3 9s. 4d. per lamp, as against £3 19s. charged in 1900 for a slightly larger number of lamps; and the Electricity Committee, who charged £3 19s. per lamp for 53 lamps in 1900, were still charging the same price in 1908 for 226 lamps, which was a large increase, and were refusing a tender by the Gas Company of £2 15s. per lamp. They were brought face to face with this aspect of municipal trading—that the Committee were using their powers to bolster up their undertaking, by charging the ratepayers a considerably higher price than the tenders they were rejecting. He would move an amendment; and in order not to bind the Council for so long a period as three years, he moved that the Gas Company's tender of £2 17s. 6d. should be accepted, and that the Electricity Committee be instructed to report to the next meeting at what price they were prepared to supply their commodity.

Mr. Brown (after the amendment had been seconded) said that Mr. Hicks was placing his theories against the practical knowledge of their Engineer. He maintained that electric light at £3 19s. was cheaper than gas at £2 15s., because in the former the ratepayers were providing the sinking fund to buy the lamp-columns, whereas in the latter case the Gas Company paid for their own lamp-columns, which would never be the property of the ratepayers. He objected to the Gas Company stealing a march on the Electricity Committee. Why should they, knowing the price the Electricity Committee wanted to charge, be allowed to put in a lower tender? That was not fair tendering. It was a sort of undercut; and he objected to it as not being business. If they had sealed tenders, he was convinced that the Electricity Committee's would be the lowest.

Alderman Delves said the Company would ask for nothing better than to be allowed to send in a sealed tender; while Mr. Richards hazarded the guess that there must be some reason for the Gas Company offering such a large reduction. He said he suspected the real truth was that if electric light could not compete with gas in cheapness now, it very soon would be able to do so, because they were expecting important developments in electric lamps. Mr. Hyde: Why not wait till then, and accept the lowest tender in the meanwhile? Mr. Tylor remarked that he was an advocate of coming to an agreement with the Gas Company, and dividing the public lighting between the two bodies. He did not believe in entering into long contracts, because great improvements were being made in electric lamps. He would also remind the Council that they had obtained sanction for a loan of £10,000; and they would stultify themselves if they did not extend their plant, as proposed. He hoped the Council would support their own undertaking, and give them the street lighting to improve their load-factor, on which the success of the works must depend. They must put the load-factor to profitable use. They had no trams in Tunbridge Wells, and did not want them; but in the absence of trams to keep their plant going, they must have the street lighting to give them a fair chance.

After various other speakers had joined in the discussion, Mr. Edwards said the Committee were attacked as if they ought to be at the Old Bailey for overcharging the ratepayers. The Gas Company's last tender was a direct insult to the Committee, and wasting the time of the Council. The Committee did not ask the Gas Company to send in a lower price; and they would not allow the Company to dictate to them what they were to charge the ratepayers for public lighting. If they were a progressive Council, they would take over the whole of the public lighting, and have done with the Gas Company. Then they could charge what they liked, and not be dictated to by the Company. If the Gas Company wrote another letter, offering a reduction of price, he would move that it lie on the table, and that no notice be taken of it. He regarded it as an insult to the Council. Mr. Snell said the Council had to choose between a small saving and a large saving, together with the fact that if they chose the Electricity Committee's tender they would have to pay more for the remaining gas-lamps, because the Gas Company said it would not pay them to light a smaller number of lamps at the lower price. The question at issue was whether the Electricity Committee were to be allowed to charge the ratepayers more than they could get the lighting done for by the Gas Company. Mr. Collyer said this difficulty would not have arisen if they had had an independent Committee; and the Council ought never to have allowed themselves to be guided by private feeling, and to have taken the control of the street lighting from an independent Committee. They saw the result of doing this would be very expensive to the ratepayers; and the change ought never to have been made. If the electric light was not paying, it would be better to let the ratepayers know the actual loss, instead of bolstering up the undertaking by overcharging for street lighting. He hoped the control would be restored to an independent Committee, and the ratepayers thus be given the benefit of the lowest tender.

The Mayor (Mr. Woollan) said that the main point had been overlooked. The Council must realize that they were jointly and severally responsible for the large capital locked up in the electricity undertaking. The Gas Company could not be put on the same footing as their own undertaking. If the amendment was carried, they would have no Committee at all, because no Committee would undertake the responsibility of carrying on the electricity undertaking if they could not have the street lighting to help it to pay its way. It was the duty of the Council to give the Committee more street-lamps, and help them to pay their way. They could not face the responsibility of accepting the lowest tender of the Gas Company, with the capital they had at stake in their own undertaking. If their charges were the highest now, he was advised by the Engineer that the time would come at some future date when they could lower their own prices.

On a division twelve voted for the amendment, and fourteen against; so that the lower tender sent in by the Gas Company was rejected by two votes.

LEEDS WATER-WORKS CONTRACT.

A Local or an Outside Firm.

At the Meeting of the Leeds City Council last Wednesday, there was a long discussion with regard to the firm to be selected for the building of the Leighton reservoir in connection with the Colsterdale water scheme. At a previous meeting, the Water Committee had recommended the acceptance of the tender of Messrs. H. Arnold and Son, a local firm, at a sum of £437,182. This, however, was £5000 more than the tender of a Scotch firm—Messrs. Morrison and Mason, of Glasgow—and eventually the matter was adjourned, in order that members of the Council might have an opportunity of making themselves familiar with the reports of four experts on the two tenders.

When the discussion was resumed last week, Mr. F. Ogden, the Chairman of the Water Committee, moved the adoption of the recommendation of the Committee that the local tender should be accepted. But at the same time he expressed his personal disapproval of this course being adopted, in view of the advice of the experts who had been called in. He pointed out that the Committee, so as to satisfy

themselves as to the class of work the contractors were doing, visited the great reservoir carried out by Messrs. Morrison and Mason for the Glasgow Corporation. This was a work of magnitude and difficulty; and it had been executed with very great skill and ability. They also visited the works carried out by Messrs. Arnold at Carlisle, Skipton, and Otley; and these were very small in comparison with that of Messrs. Morrison and Mason, and also in comparison with the work of the Leeds Corporation. Subsequently the Committee decided to call in expert advice; and they consulted their own expert Engineer (Mr. C. G. Henzell), Mr. James Watson, of Bradford, one of the ablest Water Engineers in the country, Mr. Charles Hawksley, one of the most eminent Civil Engineers, Mr. George H. Hill, another eminent Engineer, and Mr. E. L. Mansergh, who was the youngest and least experienced of the experts. Four of these five experts recommended the acceptance of Messrs. Morrison and Mason's tender; and only Mr. Mansergh advised the acceptance of Messrs. Arnold's offer. Messrs. Arnold's tender was 33 per cent. higher in the cost of masonry, in regard to which three of the four experts said that any additional cost was most likely to be incurred. Under all the circumstances, in his opinion it would be the height of folly for the Council to deliberately ignore the opinion of the greatest experts in the country; and he was quite sure that no members of the Council would adopt such a course if they were dealing with their own money, and not that of the ratepayers. The only possible excuse for such a course would be that they were getting some compensating advantage in the large employment of Leeds labour by Messrs. Arnold. But all the experts agreed that in this respect there was no advantage whatever as between one firm and the other.

Mr. Hirst, in seconding the resolution, remarked that three out of the four outside experts had expressed an opinion in favour of Messrs. Morrison and Mason; but they did not give as full and tabulated a statement of their reasons as Mr. Mansergh had done. Mr. Mansergh's report went into every detail of the question. He thought the Council ought to be in favour of giving the work to a local firm. There was only a difference of 1 per cent. between the tenders; and the Council ought to keep the work in their own area, if they paid a little more for it. All the experts agreed that either of the two firms could do the work satisfactorily; while the schedule of prices showed that if it became necessary to go down more than 200 feet, as was very likely to happen, Messrs. Arnold's contract would be an advantage to the city of over £10,000. Besides, Messrs. Arnold had already spent in Leeds nearly half-a-million of money, and this ought to entitle them to some consideration.

Among other speakers,

Alderman Hepton said the *crux* of the whole question was the experience of the rival firms; and on this ground he was bound to vote against the local firm. Dr. Dennison held that to vote for the local firm in the face of the best expert advice that could be obtained, was for the Council to place themselves in a most illogical position.

Mr. Layton pointed out that the City Water Engineer had said that Messrs. Arnold could do the work satisfactorily. What they wanted was a Leeds contract for a Leeds firm paying wages to Leeds men.

Alderman Kinder moved an amendment to refer the matter back to the Committee, with a view to the tender of Messrs. Morrison and Mason being accepted. He desired the votes to be recorded, so that if anything should go wrong in the future it would be on record that he at any rate had followed the advice of experts who were called upon to advise the Corporation.

Further discussion ensued; but eventually the amendment was defeated, and the Committee's resolution was carried by 38 votes to 16.

Does it Pay to Exhibit?

In a recent issue of the "Manchester Guardian" there appeared an article bearing the above heading, in which it was remarked that the Franco-British Exhibition has once more raised this question. The concluding paragraph is as follows: "It is sometimes urged upon manufacturers that they ought to exhibit in order to sustain or advance the national reputation; the theory being that this stimulates foreign trade, and hence is good for exporters. The difficulty lies in convincing the manufacturer that machines such as he makes will be in greater demand because of his exhibit, or, if they are, that the demand will not be supplied by foreign imitators. The manufacturer is not interested in national advertisement unless it is going to pay him personally. Hence appeals to British locomotive builders to exhibit at an exhibition like the Franco-British would hardly meet with any response. Our locomotive builders do not expect to sell their locomotives in France; and they are not interested in an attempt to prove that their products are first-class, unless there is business to be obtained in that way. This fact seems to have been realized by many foreign and colonial Governments. They realize that, for one reason or another, it may in certain instances pay the nation to advertise itself; and consequently they arrange exhibits which are not expected to have any immediate effect on the profits of any individual firm, but which may create, or assist in creating, a wave of prosperity in which all may hope to share, and for which all are therefore called upon to pay. For analogous reasons, there is much to be said in favour of co-operative industrial exhibits, organized and financed by voluntary combinations of manufacturers and others interested. In our articles on the Franco-British Exhibition, we drew attention to the co-operative exhibits of the gas undertakings of Great Britain. Such an enterprise requires faith, because probably none of the increased business which is to be expected as a result will be definitely traceable to the exhibition."

Gas in the Canary Islands.—According to the latest report of the British Consul at the Canary Islands, the gas-works, which were undertaken some time ago by a limited liability Company in Bremen with a concession for 75 years, are completed. Gas for lighting and cooking purposes is in general use; but the competition from electric light renders it doubtful whether the financial result will be satisfactory. The price is high, and complaints on this point are numerous. It is possible that considerable waste occurs, owing to ignorance of servants, who are not accustomed to the use of gas for cooking purposes.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

We have now before us the results of the working for the year ending May 15 of the undertaking of the Edinburgh and Leith Gas Commissioners. On the whole, it has been a very satisfactory year. The finances have, as a matter of fact, turned out better than anticipated; for whereas in the estimates adopted last September it was contemplated that there would be a deficit of £4993, it has been found that there has been a net surplus of £4436. The estimated revenue from the sale of gas was £279,627, and it has amounted to £1787 more. From residuals the estimated revenue was £65,662, and it has amounted to £3065 more. These are on the positive side, and are due to the increased sale of 8 million cubic feet of gas. When we turn to the other side of the account, we find evidence of the care which must have been displayed in the conducting of the works. It was estimated that 178,492 tons of coal would be carbonized. The quantity has been 2872 tons less; and yet there was an increased sale of 8 million cubic feet of gas. The cost of coal was estimated at £132,763; it has amounted to £9747 less. The strain of working under adverse circumstances must have been felt keenly by the management during the whole of the year. Theirs is now the joy of having turned the tables upon fate and brought about results with which they would have been satisfied had circumstances all along been in their favour. I have a suspicion that when the figures for the year are fully plotted out, they will show even better than the published abstract makes them appear to be. This is on account of so much more gas having been made than is accounted for as having been sold. In the year ending May, 1907, there was an increased sale of gas over the previous year of 86 million cubic feet. For last year, the increased sale is only 8 million cubic feet; and yet there was an increase in the make of nearly 29 million feet. In my unenlightened state of mind, I have been trying hard to find an explanation of this, and I can only account for it on the supposition that the Treasurer, in his abstract, only acknowledges as gas sold that for which consumers have actually paid, not that which has in reality passed through consumers' meters. We know that the season has been one in which payments have been slow to come in; and if my theory be correct, there should be found a larger sum due for gas outstanding. The accounts show this to be the case, to the amount of £4000; and this sum, with gas at 3s. per 1000 cubic feet, brings out nearly 27 million feet of gas unpaid for more than was at the closing of the accounts in May, 1907. In this supposition, the £4000, if regarded as past year's revenue, would make a considerable improvement in the financial position; but when reckoned in the accounts for the year now current, as it must be, it will form a very fine nucleus to the revenue.

At the meeting of the Commissioners on Monday at which the accounts were presented, it was reported that, under the scheme of reconstruction of Messrs. Bruce Peebles and Co., Limited, which is under consideration, the Commissioners have been offered shares in the Company, in payment of their account of £224 due for gas. It was agreed to accept the offer. The Chairman—Bailie Bryson—proposed that they record their thanks to Mr. J. Mallinson, who has resigned office as a Commissioner, for his services to the Commission for a long period of years; Mr. Mallinson being, as was stated, the Father of the Commission. The proposal was cordially agreed to.

The report by the Directors of the Stirling Gaslight Company for the year ending May 15 states that the expenditure due to capital account amounted to £7856. The improved retort-bench and stoking apparatus have given every satisfaction. The net profit for the year, after providing for ordinary maintenance and repairs and the payment of £500 from revenue to account of replacement of the retort-bench, rendered necessary by the alterations, amounts to £6334. To this has to be added £132 brought forward from the previous year; and, after payment of interest on mortgages, income-tax, and dividend on preference shares, there remains a balance of £5427 at the credit of profit and loss account. The Directors recommend payment of dividend on the original capital at the rate of 9s. 5·5d. on each share of £5 7s. 6d., and on the new ordinary shares at the rate of 11s. per share on each £10 share, amounting together to £4537, less income-tax; that a further sum of £700 be carried to the insurance fund, making it, with accrued interest, £3138; and that the balance of £417 be carried forward.

At the annual meeting of the Hawick Gaslight Company yesterday, the Chairman—Mr. R. Noble—said, notwithstanding the advance in the price of coal, last year they were able to give their consumers gas at the old price of 2s. 6d. per 1000 cubic feet. This year they had made satisfactory contracts for coal, which would enable them to reduce the price to 2s. 3½d. per 1000 cubic feet, and that for gas of from 20 to 22 candle power. They were erecting additional purifiers at a cost of £2000. Some consumers might say that their accounts were as big as ever; but, of course, such was bound to be the case, as they all burned more, and had much better lights. The cry was for more light; and if the Gas Company could give this without raising the cost, it was a boon to the inhabitants. The report of the Directors was adopted.

The Directors of the Galashiels Gaslight Company report that the profit for the year has been £2154, and that at June, 1907, the reserve fund stood at £7004; making together £9158. They recommend payment of a dividend of 10 per cent., absorbing £2100; and the placing to reserve fund of £7058. The quantity of gas manufactured during the year was 72,450,000 cubic feet; the loss by leakage was 3,477,650 feet; and the quantity used on the works and offices was 724,500 feet. The amount of gas registered as passing through consumers' meters was 68,247,850 cubic feet—an increase of 1,854,419 cubic feet. Four years ago, the older part of the retort-bench was replaced by new ovens constructed on the latest scientific principles; and in completion of the work then begun, the Directors have had the remaining part of the bench replaced in like manner, at a cost of £2170. The Company now possess two benches, each consisting of 48 ovens, of the most modern and approved description. Owing to the economies thereby effected, and the slightly lower price of coal, the Directors have been able to fix the price of gas for the current year at 2s. 9d. per 1000 cubic feet—being a reduction of 2d. per 1000 cubic feet. The Directors visited the works on June 30, and found them to be in excellent order.

In the Glasgow Town Council on Thursday, Treasurer Stevenson asked whether the Town Clerk's attention had been called to the reply given in the House of Commons by the Secretary for Scotland to a question by Sir Andrew Torrance regarding the right of town councillors to purchase residual products from the gas-works of the Corporations of which they were members. The Town Clerk read the question, and also the reply, in which the Secretary for Scotland stated that where the products were disposed of to the public at fixed and uniform prices, he was advised it did not appear that the disqualification of the Town Councils (Scotland) Act, 1900 (section 13, sub-section 5), would apply, if a councillor obtained no preference as such, but merely as a member of the public was a purchaser on general conditions. A different question would arise if any preference occurred, or any arrangement leading to the fixing of a price suitable for particular classes of purchasers, within which town councillors were known to be included. Such questions would depend upon the individual circumstances. Treasurer Stevenson suggested that the question and answer should be inserted in the minutes. The Town Clerk expressed the hope that Mr. Stevenson would be satisfied with the reading of the matter, as it was unusual to insert in the minutes questions and answers which had arisen in the House of Commons. Mr. Alexander remarked that the Gas Committee understood that the matter would be minuted. Bailie M. W. Montgomery, the Convener of the Gas Committee, also stated that this was the understanding of the Committee; but the opinion of the Town Clerk now put a different complexion on the matter. Treasurer Stevenson, with a view to testing the opinion of the Council as to whether the matter should or should not be inserted in the minutes, moved suspension of the Standing Orders. The Council refused to suspend the Standing Orders; and the matter was not minuted.

The annual meeting of the Lochgelly Gas Company, Limited, was held on Wednesday. It was reported that the profit amounted to £1038, and a dividend of 7½ per cent. was declared. The quantity of gas manufactured during the year was 18 million cubic feet, an increase of 4½ millions. The Chairman—Mr. L. Philp, J.P.—said he expected that in a short time the Company would have 1000 additional consumers. The Directors of the Elie and Earlsferry Gas Company, Limited, report that the quantity of gas consumed last year was 5,155,800 cubic feet, an increase of 641,000 cubic feet; and that fully one-fourth of the gas consumed is now used for cooking purposes. The Macduff Gas Company have paid a dividend of 5 per cent., and reduced the price of gas to 5s. per 1000 cubic feet. Mr. John Imlach, who has acted as interim Manager for some time, was appointed Manager. The Blairgowrie Gas Company have declared a dividend of 5 per cent. The Pittenweem Gaslight Company have paid a dividend of 10 per cent., free of income-tax, and have retained the price of gas at 4s. 2d. per 1000 cubic feet.

At the annual meeting of the Anstruther Gaslight Company, Limited, on Wednesday, Mr. Oliphant, the Chairman, said that, in spite of the heavy price of coal, the Company had had a very successful year, and had made a good profit. They had sold nearly a million cubic feet more gas than in the previous year. A dividend of 5 per cent. was declared; £303 was placed to depreciation fund; and £246 was carried forward. It was stated that an addition to the capital of the Company had been subscribed three times over by the shareholders.

The accounts of the Coupar Angus Gaslight Company, submitted at the annual meeting on Wednesday, showed a satisfactory increase in all departments. A dividend of 6 per cent. was declared; and it was resolved to pay off two of the recently created debenture bonds. It was also agreed to pay a honorarium to the Manager (Mr. W. F. Vernon) for his work during the year.

An augmentation of the water supply to Blairgowrie, Rattray, and Rosemount, the scheme for which has cost £20,800, was inaugurated on Thursday. The original supply for Blairgowrie was taken from Loch Benachally, on the estate of the Duke of Atholl, in 1870, and cost £7000. The new works consist of raising the embankment at the loch by 3 feet, the construction of new sluices and screening well, and the laying of an additional line of iron and fire-clay pipes, of from 8 to 12 inches diameter, from the loch to Burnhead reservoir; and three new filters. A supply of 75,000 gallons per day from October to April, and of 1,500,000 gallons daily from May to September, is guaranteed. Messrs. J. & A. Leslie and Reid, of Edinburgh, were the Engineers. The water was turned on at the opening ceremony by Mrs. Reid, the wife of County Councillor Reid. After the ceremony, Mr. W. A. Tait, of the Engineers' firm, presented Mrs. Reid with a silver epergne as a memento of the occasion. In the course of his acknowledgment of the gift, Mr. Reid stated that there could not be a more ideal gathering ground than around Loch Benachally; there being no cultivated land within miles of the loch.

New Joint-Stock Companies.—The Loddon Gas Consumers' Company, Limited, has been registered with a capital of £2000, in £1 shares, to take over the business of manufacturers, suppliers, and sellers of gas, gas-fittings, and other articles, together with the business of letting gas-stoves and other fittings, carried on at Loddon by the Loddon Gas Company, Limited (in liquidation), and to adopt an agreement with the Company. Under the title of "Gazeifieur Universel, Limited," a Company has been registered with a capital of £30,000, in £1 shares (28,000 preference and 2000 founders' shares), to adopt an agreement with S. Nusenblot, of Paris, and to carry on the business of gas makers, manufacturers of apparatus for generating gas by the carburization of air or otherwise, and for treating, storing, applying, and distributing gas or other illuminants, &c. The Vulcan Stove Company, Limited, has been registered with a capital of £20,000, in £1 shares (7000 preference), to take over the business of manufacturers of gas heating and cooking apparatus carried on at Birmingham by Messrs. Wright and Butler, and a similar business carried on at Exeter as part of that of Messrs. Willey and Co. There will be no initial public issue. The Dundonald Gas Company has been registered in Edinburgh, with a capital of £3000, in £1 shares, for which the public are not invited to subscribe. The vendors are Mr. Robert Bruce Anderson and Mr. George William Anderson, of Westminster.

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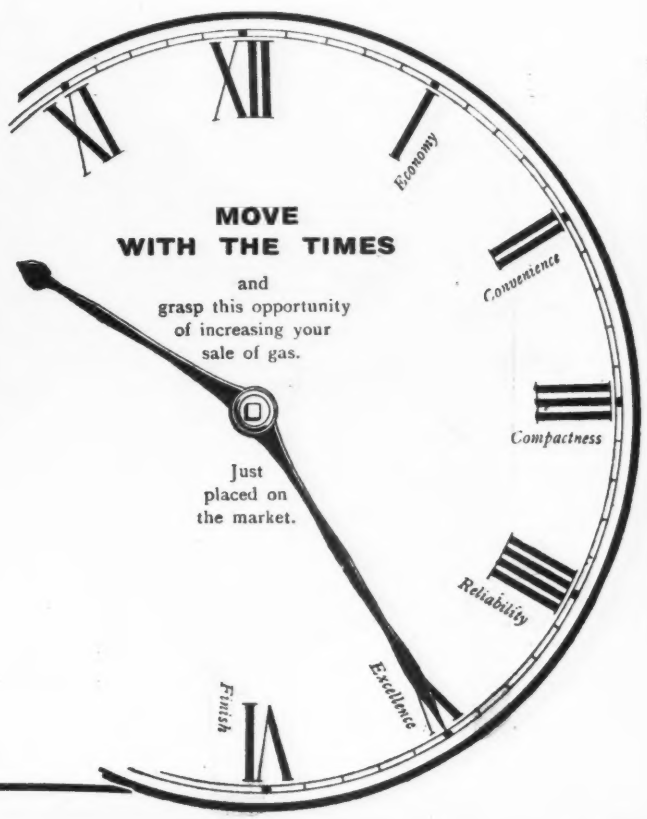

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *July* 4.

There has been no recovery from the stagnation which set in at the end of May. On the contrary, the market has continued to droop; so that at the close the quotations are down to £11 6s. 3d. per ton f.o.b. Hull, £11 7s. 6d. per ton f.o.b. Liverpool, and £11 10s. per ton f.o.b. Leith. There has been no interest whatever on the part of direct buyers; so that purchasing has been practically all for the purpose of covering contracts made in advance, and, as these contracts were largely covered by purchases already made, actual demand has not been equal to available supply. Although producers have very materially modified their views with regard to the forward position, they have not kept in line with the market, and, consequently, have not made any important sales. Business done has been mainly taken speculatively, at about the level of spot prices.

Nitrate of Soda.

This article has been very quiet in the forward position, excessive visible supply discouraging buyers; but actual stocks being in moderate compass, spot prices have been advanced to 10s. and 10s. 3d. per cwt. for 95 per cent. and refined qualities respectively.

Tar Products. LONDON, *July* 6.

The markets are still quiet, and changes are not important. Pitch is very quiet, and there are no signs of an improvement at present. In London, business has been done at 19s. for next season's delivery; while on the east coast offers of 18s. 6d. have been both accepted and declined. In Liverpool 18s. 6d. and in Manchester 17s. 6d., both f.a.s., are reported to have been accepted. Creosote is steady, but without alteration in price. Low figures are stated to have been accepted in Liverpool for prompt delivery. Benzol 90 per cent. is quiet. Business has been done in London at 7½d. for prompt, and 7¾d. to end of the year. Fifty-ninety per cent. benzol and toluol are neglected. There are sellers of the latter in London for prompt at 7¾d. Solvent naphtha is steady, but not much business is doing. High-flash naphtha is weak. Heavy oils are firm and in fair demand. Carbolic acid is weak; the Continental consumers declining to buy for near delivery. Naphthalene is steady, but little business is doing. Creosote salts are firm in tone; but buyers are mostly well supplied. A small quantity of anthracene has been sold at 1½d. per unit.

The average values during the week were: Tar, 11s. 6d. to 15s. 6d., *ex* works. Pitch, London, 19s.; east coast, 18s. to 18s. 6d.; west coast, 17s. 6d. to 18s. 6d., f.a.s. Benzol, 90 per cent., casks included, London 7½d. to 7¾d., North 7d. to 7¼d.; 50-90 per cent., casks included, London 7½d. to 7¾d., North 7d. to 7¼d. Toluol, casks included, London, 7¾d. to 8d., North 7¼d. to 7½d. Crude naphtha, in bulk, London 3¼d. to 3¾d., North 3d. to 3½d.; solvent naphtha, casks included, London 10d. to 10½d., North 9d. to 9½d.; heavy naphtha, casks included, London 10d. to 10¼d., North 9d. to 9¼d. Creosote, in bulk, London 2⅜d. to 2½d., North 2d. to 2¼d. Heavy oils, in bulk, 2⅜d. to 2⅝d. Carbolic acid, 60 per cent., casks included, east coast 1s. 5½d. to 1s. 5⅝d., west coast 1s. 5d. to 1s. 5¼d. Naphthalene, £4 10s. to £8 10s.; salts, 35s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market has been dull throughout the week. Prices closed lower all round, and still with a downward tendency. In London, the principal Gas Companies are so well sold as to be practically out of the market. Outside makes have been sold upon Beckton terms at £11 7s. 6d. to £11 10s. In Hull, business has been done at £11 5s. to £11 7s. 6d.; and in Liverpool, at £11 7s. 6d. to £11 10s. In Leith, the market is nominally £11 10s. to £11 12s. 6d.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Owing no doubt to the hot weather conditions prevailing in this part of the country, the whole of the colliery owners in the Manchester district resolved to lower the prices of all qualities of house coals, cobbles, and nuts 10d. per ton on and from July 1. Some of the colliery proprietors in the Wigan district have adopted a like reduction. No change has been made in the prices of other classes of coal beyond the 6d. per ton reduction on last year's contracts for gas coal and cannel, as previously reported. In consequence of the general depression in the iron trade, the requirements of engineers are easier. The Salford Borough Council have decided, by 17 votes to 10, that the accepted tenders for the supply of coal and cannel should not be published in the synopsis of the minutes of the Council. The average quotations of prices of coal, at the pits, in the Manchester district are: Best house coal 14s. 2d. to 15s. 8d., secondary 13s. 2d. to 14s., common 11s. 2d. to 12s. 8d., burgy 10s. 6d. to 11s. 4d., best slack 9s. 6d. to 10s. 4d., medium 8s. 6d. to 9s., lower qualities 7s. 9d. to 8s. 4d., coal for shipping 13s. to 14s. f.o.t. Furnace coke is 18s. to 24s.

Northern Coal Trade.

There has been some renewal of activity in the coal trade; but it is unequal in certain branches. In the steam coal trade, best Northumbrians are steadier at from about 13s. to 13s. 3d. per ton f.o.b., second-class steams 11s. 9d. to 12s., and steam smalls from about 5s. 6d. to 6s. 6d. The production of steam coals is now full; but the export is heavy, and the output is thus well taken up. In the gas coal trade, the demand is steadier; and now that stocktaking is effected, it is probable that the works will begin to take larger quantities. The foreign request is heavy; and the production at the collieries is nearer the

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normal volume again. Durham gas coals are being quoted from about 10s. to 11s. per ton f.o.b. for the usual kinds, and from 11s. 9d. for "Wear specials." Among contracts, one for Italy is reported, for about 48,000 tons over next year at somewhere near equal to 10s. 6d. f.o.b. A few smaller contracts are at somewhere near the same price; so that these contracts do not very materially differ from the market quotations. Coke is quiet; but gas coke is steadied by the very low production. Good gas coke may be put as from 15s. 6d. to 16s. per ton f.o.b.

Scotch Coal Trade.

A fair demand continues, particularly in the shipping branch of trade. In the home department, the approach of the miners' holidays makes a little activity visible. The movements, however, scarcely affect prices, which are quoted at: Ell 10s. 6d. to 12s. 6d., splint 10s. 9d. to 11s., and steam 10s. to 10s. 3d. The shipments for the week amounted to 341,352 tons—an increase of 26,891 tons upon the previous week, but a decrease of 7025 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,596,147 tons—a decrease of 435,187 tons upon the corresponding period of 1907.

Thirlmere Water for West Lancashire Townships.—The Chorley Rural District Council's scheme to supply eight townships in West Lancashire with water from the Thirlmere pipe-line was inaugurated a few days ago, when Mr. Thomas Wilde Price, with a golden key presented to him for the purpose, turned on the water in the presence of an interested company. The scheme has meant the laying of 27 miles of mains at an estimated cost of upwards of £15,000, exclusive of connections.

Quality of the Tunbridge Wells Water Supply.—Owing to the presence of iron in solution in their underground water supplies, the Tunbridge Wells Corporation have been carrying out trials with the Candy patent automatic compressed air and oxidizing water-works filters, in order to ascertain if these filters would efficiently remove the iron. The total quantity of water dealt with by the trial filters from Jan. 6 to May 23 was 31¼ million gallons; and Dr. Muter, investigating the results for the Corporation, reported that the water was of the highest organic purity, and that the desired object—the removal of the iron in solution—had been effected in a highly efficient manner. Upon a later analysis, dated May 22, Dr. Muter also reported that the result was very satisfactory, and, taken in conjunction with the former examination on March 19, showed that the filters are continuing to perform their work in the same highly efficient manner. The Borough Engineer reports that he finds the capital cost of sand filters of the ordinary gravity type to be nearly five times greater than that of the Candy filters, while their working expenses are but a small fraction of the annual cost entailed by sand filters. The Tunbridge Wells Corporation are, therefore, about to lay down six Candy filters to deal with the underground well supplies containing iron.

Salford Corporation Gas Undertaking.

The report of the Salford Corporation Gas Committee for the year to March 31 last (which is signed by the Chairman, Mr. F. S. Phillips) states that there was a considerable augmentation in the number of consumers; and the sales of gas increased by 2·65 per cent. The demand for gas appliances generally was very satisfactory; and the business in cooking-stoves increased. The works and plant have been maintained in a thoroughly efficient condition; and a new bench of inclined retorts is in course of erection at the Albion Street works. The coal and cannel carbonized during the year amounted to 166,898 tons, and the quantity of gas made to 1,716,077,000 cubic feet, of an average illuminating power equal to 19·25 standard candles—the parliamentary standard being 18 candles within the borough, and 17 candles as tested in the out-districts. The total receipts realized from residuals show a considerable increase compared with the previous year. Owing to the large rise in the price of coal, the price of gas was increased on June 30 last by 3d. per 1000 cubic feet to all ordinary consumers; and the quantity supplied for 1d. to the prepayment meter consumers was reduced from 30 to 28 cubic feet. The more favourable terms obtained in purchasing the coal for the coming year have enabled the Committee to recommend a reduction of 3d. per 1000 cubic feet in the price of gas to all consumers by ordinary meter, and an increase in the quantity of gas supplied to prepayment meters consumers from 28 to 30 cubic feet for 1d. This is a very satisfactory showing, it must be allowed.

Gas-Meter Testing at Edmonton.—At the monthly meeting of the Middlesex County Council last Thursday week, the annual report of the General Purposes Committee was submitted. In the course of it the Committee stated that the gas-meter testing-station at Edmonton was opened in July, 1900, as the result of an agreement entered into between the County Council and Messrs. Thomas Glover and Co., Limited, who were desirous of having gas-meters manufactured by them tested and stamped in close proximity to their works at Edmonton. On their undertaking to make good any loss which might fall upon the Council, a testing-station was opened. The staff consists of an inspector, seven assistants, one junior assistant, a clerk, and a porter; and the apparatus has recently been re-verified by officers of the Standards Department of the Board of Trade. The total number of meters tested since the opening of the station has been 564,867; and fees amounting to £17,116 have been received. The details of the meters sent to the station during the twelve months were as follows: From gas companies and consumers, 3067 received, 1112 stamped, and 1955 rejected; from makers, 79,315 received, 76,890 stamped, and 2425 rejected. The net profit last year amounted to £1008, and the total amount which has been applied in aid of the county rate since the station was first opened is £7338.

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CAMBERWELL, LONDON, S.E.

Pontefract Gas-Works Accounts.

The accounts of the Pontefract Gas-Works for the period ending March 31 have just been published. The works were acquired compulsorily under the Corporation Act of 1906; and it will be remembered that the question of purchase was fought out in both Houses. The transfer took place on July 1, 1907; and the figures available are therefore for nine months only. The total working expenses amounted to £4699, and the total income was £8512; showing a gross profit of £3813, of which sinking fund instalment absorbed £795, interest on loans, &c., £2172, income-tax £169, and proportion of costs of the Act £600, leaving a net profit of £77 to carry forward, which the Council consider highly satisfactory. Unfortunately for the Corporation, the coal contracts expired at the time of the transfer; and an immediate advance of 2s. per ton had to be paid, which necessitated an increase in the price of gas from 2s. 11d. to 3s. 2d. per 1000 cubic feet. The gas made during the nine months to March 31 was 42,466,400 cubic feet, an increase over the corresponding period of 2,616,100 cubic feet, equal to 6 per cent. It is just over four years since the old Company commenced supplying slot-meters; and the demand during the last twelve months has been so great that over 1500 are now fixed and working. Since the Council took over the concern, a good business has also been done in stoves. The erection of a new retort-house at a cost of £3000 is at present proceeding; and when this is completed, it will tend to much greater efficiency and more economical working, as the plant will then be able to cope with double the demand, if necessary. At a meeting of the Council last Wednesday, fresh contracts for coal were entered into at substantial reductions; and this concession, together with the fact that several revenue items incidental to a first year's working will not recur in the present year, enabled the Gas Committee to recommend that the 3d. per 1000 cubic feet be taken off as from July 1. Needless to say, the Council unanimously adopted the recommendation; and the Manager (Mr. L. V. Whitaker) was complimented on the successful result which had been attained.

Suicide by Gas at Tonbridge.—The body of a grocer at Tonbridge was some days ago found lying behind the shop-counter. Near by was one end of a piece of tubing, the other end of which was attached to the gas-bracket. The Coroner's Jury found that deceased committed suicide while suffering from temporary insanity.

A Gas Supply for Llandudno Junction.—The Conway Town Council have decided to promote a Bill in the next session of Parliament to enable them to supply gas outside the boundary of the borough in the urban portion of Llangwstenin, which is known as Llandudno Junction. It was explained that repeated appeals had been made by residents in this district for a gas supply; that a memorial had been received, signed by 150 ratepayers, to the same effect; and that the Council would have the support of the Ratepayers' Association.

Labour Troubles at Budapest.—According to a telegram which reached London through Reuter's Agency last Thursday, the employees at the Budapest Gas-Works wrecked the machinery on the Tuesday evening, and allowed much gas to escape. Application was at once made to the Government for protection; and a detachment of military engineers proceeded to the works to protect the peaceable men. A later telegram was to the effect that all the employees had struck, with the exception of those who had signed the wages tariff of the Company. The military engineers were carrying on the work, and order was not disturbed. The cause of the strike is stated to be the refusal of the Company to recognize the Gas-Workers' Union. The Company have agreed to an advance in wages and an experimental short day; but they insist on the dismissal of 27 of the ringleaders of the movement.

Proposed Water Board for Glamorgan.—At the close of a private conference last week between representatives of the District Councils in Glamorgan and of the Glamorgan County Council, the following statement was handed to the Press: The Conference decided to appoint an Executive Committee to frame a scheme and formulate the heads of a Bill to be introduced into Parliament in the next session for the formation of a Water Board for the county; the Committee to include one representative from each of the District Councils which are favourable to the scheme, and to have power to invite the adhesion of any other districts that may subsequently desire to take part. The Committee were authorized to confer with the District Councils adjoining the county in any matters of joint interest, and also with the county boroughs of Merthyr and Swansea. The conference went through the heads of the report of Mr. R. E. Middleton, and adopted generally the recommendations, with some minor amendments.

The Management of the Longton Corporation Gas Undertaking.—In the "JOURNAL" last week, we gave some particulars from the report by Mr. W. Langford, the Engineer and General Manager of the Gas and Electricity Departments of the Longton Corporation, on the working in the past year. At the meeting of the Town Council at which the report was adopted, the Vice-Chairman of the Committee (Mr. Hulse) spoke in highly complimentary terms of Mr. Langford's management of the works. These were supported in a leading article in the "Staffordshire Sentinel" on Monday last week, when some further extracts from the report were published. In the course of his comments, the writer said: "The report itself is clear and exhaustive, and the statistics show that the undertaking is in a healthy condition, and that it is managed with great practical ability, with a firm control over details, and with financial shrewdness. Mr. Langford undoubtedly ranks high among the gas engineers of the country; and in Alderman Brookfield, J.P., and Mr. W. Hulse, J.P., the Committee have an admirable Chairman and Vice-Chairman. Since the works were transferred to the Corporation, as much as £65,397 has been paid to the relief of rates; so that the gas undertaking has been a good speculation for the town. . . . Specially creditable to Mr. Langford are the excellent output per ton of coal and the business results obtained from the process of manufacture. The report is certainly one which cannot fail to be eminently gratifying, not only to Longton but to the Potteries as a whole; and it materially adds to the high reputation as a Gas Manager and Engineer which Mr. Langford already enjoyed."

INSTALLATIONS

Extract

from

Printed Report

presented to the

Shareholders

of the

Lampeter Gas Co.

May 1908.

"The Canvassing and Instal-
"lation work done by the
"Richmond Gas Stove and
"Meter Co., Ltd., Warrington
"and Queen Victoria Street,
"London, has proved **very**
"**satisfactory,** and the
"increase in gas consumption
"has been **17** per cent. over
"the previous **12** months."

RICHMOND'S

ADVERTISEMENT OF THE RICHMOND GAS STOVE & METER CO., LTD.
London Offices and Show-Rooms: 132, QUEEN VICTORIA STREET, E.C.
General Offices and Works: WARRINGTON, &c.

Sales of Shares.—Last Wednesday, Messrs. P. Head and Sons sold by auction some £25 ordinary shares in the Staines and Egham Gas Company at £65 10s. to £66 each; parcels of five £10 ordinary shares in the South-West Suburban Water Company at £70 and £70 10s. apiece; and £200 of ordinary stock of the Richmond Gas Company at £244 10s. The same day, eleven ordinary £5 shares in the Ayr (N.B.) Gas Company, Limited, were sold by auction for £7 0s. 6d. each.

Bolton Water-Works Profits.—The balance-sheet, showing the result of the past year's working of the water undertaking of the Bolton Corporation, was submitted at a recent meeting of the Water Committee. There was a balance of £1400, which will be transferred to the reserve account, in accordance with the requirements of the Local Act of 1905. Prior to the passing of that Act, the Committee had been in the habit of handing over, out of the profits, sums up to £14,000 in aid of the rates, but no moneys can now be so transferred until the reserve fund has reached £80,000. Evidently the small amount of profit shown on the working of the past year is exercising the minds of the members of the Committee, as a Sub-Committee have been appointed to consider and report as to what alteration they consider desirable should be made in the charges for water, both for domestic and trade use.

Municipal Electricity Accounts.—The Southwark Borough Council have for the first time charged a portion of the legal and parliamentary expenses incurred in defence of the municipal electricity undertaking against the revenue accounts; but a sum of £54 out of £90 has been placed against the general rate, on the ground that Gas and Electricity Bills would have been opposed to this extent if there had been no municipal undertaking. Mr. Carson Roberts, the District Auditor, has once more objected to the electricity accounts up to each March 31 not showing the loan interest and the instalments of principal accruing to this date; and the Council have resolved to partially comply with his suggestion by charging half the instalment of principal and the whole of the interest accruing to March 31 last (£754 out of £1139) against the accounts closing on that date. The result is that the total accounts for the year show a considerable adverse balance.

New Water-Main at Plymouth.—The laying of the new main which practically duplicates the means of supplying Plymouth with water was completed last week, and the main was tested, with very satisfactory results, by the Water Engineer (Mr. F. Howarth) and the Chairman of the Water Committee (Mr. C. H. Tozer). The new main is laid from the Roborough reservoir to the Crown Hill reservoir, a distance of three miles. For about two miles of the length the pipe has a diameter of 24 inches; the remainder being 20 and 18 inches respectively. The connection to the outlet at Roborough is 36 inches. The carrying capacity of the pipe is about 2 million gallons per day. Between Crown Hill and the Hartley reservoir, whence the distribution is made to the town, there are two mains—one 24 inches, and the other 15 inches in diameter; while from the storage reservoir at Burrator, on Dartmoor, and the Roborough reservoir the leat is still available as a means of supply in the event of accident to the main which carries the water between these points. The laying of the new pipe just completed has been carried out, under the supervision of Mr. Howarth, by workmen engaged by the Corporation.

Mr. W. Matthews, who, as our readers may remember, has relinquished the position of Water-Works Engineer to the Southampton Corporation, has taken offices at No. 39, Victoria Street, Westminster, where he is practising as a consulting engineer.

The appeal of the Manchester Corporation against the assessment of their Thirlmere water-works in the parishes of St. John's, Castlerigg, and Wythburn was down for hearing at the Cumberland Quarter Sessions last week; but on the application of the Corporation, the matter was postponed to the next sessions, with the consent of the Cockermouth Union Assessment Committee.

In consequence of the lightning passing along the electric wires at the residence of Mr. Walter Hicks, at St. Austell, a gas-pipe running between the floor of a bedroom and the drawing-room became cracked, and an explosion was caused by the escaping gas becoming ignited by an electric spark. The gas was at once turned off at the main, and the fire was promptly got under by members of the household, before the arrival of the fire-brigade.

Owing to the increased demand for gas, the Stamford and St. Martin's (Stamford Baron) Gas Company, acting on the recommendation of Mr. F. J. West, their Manager, and the advice given by their Consulting Engineer—Mr. R. G. Shadbolt, of Grantham—are modernizing their carbonizing plant by pulling down six existing beds containing 29 retorts on the direct-fired principle, and replacing them with five settings of eight retorts on the regenerator principle, with travelling platforms, &c. The capacity of the retort-house will be increased by about 100 per cent. by the alterations and extensions here referred to. The contract has been entrusted to Messrs. Robert Dempster and Sons, Limited, of Elland.

One of the latest of the large firms to remove their works from the Metropolis is that of George Kent, Limited, manufacturers of the "Venturi" and other water-meters, hydraulic apparatus, &c. For some years the business was carried on in High Holborn; but the necessity for extension, and the difficulty of finding a suitable site in London, led to the acquisition of one at Luton, where commodious works have been erected. In planning them, the main idea has been to minimize labour and facilitate production. All the operations are conducted on one level. The raw material is received at one end of the works, and undergoes its various stages of manufacturing on its way through; the finished article being completed packed, and despatched at the other end. It is estimated that the output capacity for water-meters alone per week will be 400. A club and mess building is being erected for the employees. At a luncheon given at the new works last Tuesday, the Mayor and Corporation of the borough were present, and gave a hearty welcome to the firm.

THE
PARKINSON
STOVE CO., LTD.
SLOT COOKERS

Intermediate Grade
COOKERS.

Write—
THE PARKINSON STOVE COMPANY, LTD.,
Stour Street, Spring Hill,
BIRMINGHAM.

The International Association of Tube Makers, which was recently instituted, and included tube makers of Britain, America, France, Germany, and Italy, has been dissolved. This, it is reported, promises to bring about a war of rates between American and British makers. The Americans broke away from the agreement as a protest against a large South American order having been accepted by a Glasgow house, whereas under the international agreement it is stated that the order fell within the scope of the American makers. Rates have already been cut fully 10 per cent., and a larger cut is anticipated. Another report says: "It has been evident for several weeks past that the producers were becoming restive under the restrictions imposed by the agreements, in view of the growing scarcity of orders. German makers were stated to be dissatisfied with the existing arrangement under which they found themselves entirely helpless as regards the British market; while British merchants were said to be displeased with the 'c.i.f.' quotation basis inaugurated by the International Association. One of the chief grounds of complaint was that producers who sold to merchants on 'c.i.f.' terms were frequently able to trace the ultimate buyers, and so increase their direct connection, at the expense of the merchant trade." Quite recently it was reported that negotiations were proceeding for the combination of the Scottish tube-makers into one amalgamated concern; but presumably the dissolution of the Association will put an end to the negotiations for the time being. Rates on Thursday were cut fully 10 per cent.; and a larger cut is anticipated.

"ILLUMINATING TRUTHS."

LEAFLETS FOR DISTRIBUTION.

No. 1.—"The Sanitary Aspects of Gas and Electric Lighting."
No. 2.—"The Cleanliness of Illuminants: The Eyesight."
No. 3.—"Fire Risks."
No. 4.—"The Relative Cost of Gas and Electricity, and Matters affecting it."
No. 5.—"On Reliability, with Instances of Misplaced Confidence."
No. 6.—"On Shop Lighting, with Special Reference to the Flame Arc Lamp."
No. 7.—"The Osram Lamp: Fiction and Fact."

his series of Leaflets will be useful, not only for distribution among Householders generally, but for circulation among Shareholders to fortify them with arguments in defence of the commodity in which they have invested capital. Copies of each Leaflet should also be kept in every Gas Undertaking's Show-Rooms.

Prices for Quantities on Application to WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

AGENT (INCANDESCENT MANTLES). B.A. 1780, Agence Havas, Brussels.
SUPERINTENDENT OF METER INSPECTORS. Leeds Gas Department. Applications by July 18.
CLERK. No. 4962.
FOREMAN FITTER AND PLUMBER. No. 4961.
GASHOLDER ERECTOR. Clayton, Son, and Co.
RETORT SETTERS. Ferndale Gas-Works.
RETORT SETTERS. No. 4963.

Situations, &c., Wanted.

TRAVELLER. No. 4958.
DRAUGHTSMAN. "A. K.," c/o Street's.

City and Guilds Examination.

CORRESPONDENCE CLASSES. Correspondence College Company.

Plant (Second-Hand), &c., Wanted.

BRIDGE PIPES. Malton Gas-Works.
LAMP COLUMNS. A. Sparks, Dalkeith.

Plant (Second-Hand), &c., for Sale.

RETORT-HOUSE FITTINGS, PURIFIERS, EXHAUSTERS' WASHERS, &c, Hastings and St. Leonards Gas Company.
STREET LAMPS. Hereford Gas-Works.

Tank Waggon for Hire. Shepherd, Rochdale.

Patent to Sell or Licences to Manufacture.

TUBES, &c. Lloyd Wise and Co., Lincoln's Inn Fields.

Stocks and Shares.

UXBRIDGE GAS COMPANY. July 14.

TENDERS FOR

Coal and Cannel.

HEYWOOD GAS DEPARTMENT. Tenders by July 11.
LEIGH CORPORATION. Tenders by July 17.
LONGTON GAS DEPARTMENT. Tenders by July 18.
MALTON GAS COMPANY. Tenders by July 13.
NORTHWICH GAS COMPANY. Tenders by July 9.
OLDHAM GAS DEPARTMENT. Tenders by July 14.
RAMSGATE CORPORATION. Tenders by July 20.
ROTHWELL GAS DEPARTMENT. Tenders by July 15.

Coke-Hoppers.

COVENTRY GAS DEPARTMENT. Tenders by July 13.

Fire-Clay Goods.

MILLOM GAS DEPARTMENT. Tenders by July 14.

Oil for Gas Manufacture.

MANCHESTER GAS DEPARTMENT. Tenders by July 16.
PONTYPRIDD GAS DEPARTMENT. Tenders by July 27.

Tar and Liquor.

HANWELL ASYLUM. Tenders by July 11.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 17.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 10	10	Alliance & Dublin 10 p.c.	19—20	..	5 0 0
268,324	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
310,000	Stk.	Jan. 16	4	Do. 4 p.c. Deb.	100—103	..	3 17 8
200,000	5	May 29	6¼	Bombay, Ltd.	6—6⅛	..	5 0 0
40,000	5	,,	6¼	Do. New, £4 paid	4¼—4⅜	..	5 9 6
50,000	10	Feb. 27	14	Bourne-mouth Gas and Water	10 p.c.	28—29	..	4 16 7
					B 7 p.c.	16½—16⅝	..	4 3 7
					Pref. 6 p.c.	14⅜—15⅜	..	3 17 5
51,810	10	,,	7	Brentford Consolidated	242—247	+2	5 1 3
53,200	10	,,	6	Do. New	180—185	..	5 2 8
380,000	Stk.	,,	12½	Do. 5 p.c. Pref.	120—125	..	4 0 0
300,000	,,	,,	9⅜	Do. 4 p.c. Deb.	100—105	..	3 16 2
50,000	,,	,,	5	Brighton & Hove Orig.	205—210	+3	5 7 1
206,250	,,	June 12	4	Do. A. Ord. Stk.	152—157	..	5 5 1
220,000	Stk.	Mch. 12	11⅛	British	42—43	..	4 13 0
246,320	,,	,,	8⅛	Bromley, Ord. 5 p.c.	116—119	..	5 0 10
460,000	20	Mch. 27	10	Do. do. 3½ p.c.	86—89	..	5 1 2
104,000	Stk.	Feb. 13	6	Buenos Ayres (New) Ltd.	11—11¼	..	6 1 9
165,700	,,	,,	4⅜	Do. 4 p.c. Deb.	91—93*	..	4 6 0
500,000	10	May 14	7	Cagliari, Ltd.	24—25	..	5 16 0
250,000	Stk.	June 26	4	Cape Town & Dis., Ltd.	4—6	..	—
150,000	20	Mch. 12	7½	Do. 4½ p.c Pref.	5—7	..	6 8 7
100,000	10	—	—	Do. 6 p.c. 1st Mort.	46—48	..	6 5 0
100,000	10	Apl. 26	4½	Do. 4½ p.c. Deb. Stk.	88—90*	..	5 0 0
50,000	50	May 2	6	Chester 5 p.c. Ord.	111—113	..	4 8 6
100,000	Stk.	June 26	4½	Commercial 4 p.c Stk.	104—109	..	4 15 5
157,150	Stk.	Feb. 27	5	Do. 3½ p.c. do.	100—105	..	4 15 3
1,493,280	Stk.	Mch. 12	5⅞	Do. 3 p.c. Deb. Stk.	81—83*	..	3 12 3
560,000	,,	,,	5	Continental Union, Ltd.	112—117	..	5 11 1
475,000	,,	June 26	3	Do. 7 p.c. Pref.	136—141	..	4 19 3
800,000	Stk.	June 12	6½	Derby Con. Stk.	121—123	..	4 9 5
200,000	,,	,,	7	Do. Deb. Stk.	103—105	..	3 16 2
460,170	Stk.	—	5½	East Hull 5 p.c. Ord.	100—103	..	4 17 1
55,000	,,	—	4	European, Ltd.	23—24	..	5 0 0
148,995	,,	Mch. 31	5	Do. £7 10s. paid	5 2 10	..	5 2 10
486,090	10	Jan. 30	12	Gas-light and Coke	4 p.c. Ord.	97—98	..	4 9 9
354,060	10	,,	12		3½ p.c. max.	87—90	..	3 17 9
15,182,590	Stk.	Feb. 13	4⅕		4 p.c. Con. Pref.	106—109	..	3 13 5
2,600,000	,,	,,	3½		3 p.c. Con. Deb.	83—85	..	3 10 7
3,799,735	,,	,,	4	Hastings & St. L. 3½ p.c.		93—93	..	5 2 0
4,193,975	,,	June 12	3	Do. do. 5 p.c.		112—115	..	5 13 1
258,740	Stk.	Mch. 12	5	Hongkong & China, Ltd.		18—19	..	5 15 9
82,500	,,	,,	6½	Imperial Continental		179—182	..	4 7 11
70,000	10	Apl. 29	11	Do. 3½ p.c. Deb. Red.		93—95	..	3 13 8
4,940,000	Stk.	May 14	8	Lea Bridge Ord. 5 p.c.		113—118	..	5 1 8
473,600	Stk.	Feb. 13	3½					
195,242	Stk.	Mch. 12	6					

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
561,000	Stk.	Feb. 27	10	Liverpool United A	232—234	..	4 5 6
718,100	,,	,,	7	Do. B	165—167	..	4 3 10
306,083	,,	June 26	4	Do. Deb. Stk.	104—106*	..	3 15 6
152,736	Stk.	Feb. 13	7⅞	Maidstone 5 p.c.	136—141	..	5 8 2
75,000	5	June 26	6	Malta & Medn., Ltd.	4—4⅛*	..	6 13 4
560,000	100	Apl. 1	5	Met. of 5 p.c. Deb.	100—102	..	4 18 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	May 29	3½	Monte Video, Ltd.	11—12	..	5 16 8
1,775,892	Stk.	Feb. 27	4⅝	Newc'tle & G'tesh'd Con.	108—109	..	4 4 10
418,460	Stk.	June 26	3½	Do. 3½ p.c. Deb.	90—91*	..	3 16 11
15,000	10	Feb. 27	10	North Middlesex 10 p.c.	20—21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13½—14½	..	4 16 7
300,000	Stk.	Apl. 29	8	Oriental, Ltd.	140—143	..	5 11 11
60,000	5	Mch. 27	7	Ottoman, Ltd.	6—6⅛	..	5 7 8
398,490	5	Apl. 29	7	Primitiva Ord.	6¼—6⅝	+¼	5 3 8
796,980	5	Jan. 30	5	Do. 5 p.c. Pref.	4¼—5⅛	..	4 17 7
488,900	100	June 1	4	Do. 4 p.c. Deb.	91—93	..	4 6 0
1,000,000	10	Apl. 29	8	River Plate Ord.	13—13½	..	5 18 6
312,650	Stk.	June 26	4	Do. 4 p.c. Deb.	91—93*	..	4 6 0
250,000	10	Apl. 10	8	San Paulo, Ltd.	13½—14	..	5 14 4
125,000	50	July 1	5	Do. 5 p.c. Deb.	49—51*	+1½	4 18 0
135,000	Stk.	Mch. 12	10	Sheffield A	245—247	..	4 1 0
209,984	,,	,,	10	Do. B	245—247	..	4 1 0
523,500	,,	,,	10	Do. C	245—247	..	4 1 0
70,000	10	May 29	10	South African	13—14	—1	7 2 10
6,429,895	Stk.	Feb. 13	5⅛	South Met., 4 p.c. Ord.	118—120	..	4 8 10
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	84—86	..	3 9 9
209,820	Stk	Mch. 12	8	South Shields Con. Stk.	155—157	+1	5 1 11
£05,03 £	Stk.	Feb. 27	5⅛	S'th Suburb'n Ord. 5 p.c.	116—119	..	4 9 7
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
117,058	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk.	122—127	..	3 18 9
502,310	Stk.	May 14	5	Southampton Ord.	105—110	..	4 10 11
120,000	Stk.	Feb. 27	6⅔	Tottenham and Edmonton	A 5 p.c.	120—125	..	5 8 0
398,940	,,	,,	5⅔		B 3½ p.c.	106—108	..	4 17 3
149,470	,,	June 26	4		4 p.c. Deb.	98—103*	..	3 17 8
182,380	10	June 12	8	Tuscan, Ltd.	10—10½	..	7 12 4
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	97—99*	+½	5 1 0
193,742	Stk.	Feb. 27	5	Tynemouth 5 p.c. max.	106—107	..	4 13 6
255,636	Stk.	Feb. 13	6½	Wandsworth and Putney	B 3½ p.c.	128—133	..	4 17 9
80,075	,,	June 26	3		3 p.c. Deb. Stk.	72—77*	..	3 17 11
845,872	,,	Feb. 27	5⅜	West Ham 5 p.c. Ord.		100—102	..	5 0 6
185,000	,,	,,	5	Do. 5 p.c. Pref.		120—125	..	4 0 0
228,300	,,	June 26	4	Do. 4 p.c. Deb. Stk.		100—105*	..	3 16 2

Prices marked * are "Ex div."

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

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PALMERSTON HOUSE,
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"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
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For Terms, apply: A. C. FRASER'S FIRE CEMENT COMPANY, Corbett Street, Bradford, MANCHESTER.

TO Gas Managers, &c., Wanted, Old Condemned GAS-METERS, from 1-light to 1000-light, for destruction to re-claim Metals. Write for Prices, Stating Quantities and Sizes, and if Wets or Drys. Scrap Metals, Drosses, Metal Shop Sweepings, &c., also bought
J. WILSON, Pleasant Grove, York Road, King's Cross, LONDON, N.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
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Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

SULPHURIC ACID.

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Telegrams: "CHEMICALS, OLDBURY."

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

PINCHBECK'S Meters and Burglar PROOF STRONG BOX.
See illustrated advertisement, June 23, p. V. of Centre
J. PINCHBECK & Co., Adams Place, George's Road, HOLLOWAY, N.

GAZINE—A radical Solvent and Pre- ventative of Naphthalene deposits, and the Automatic cleaning of Mains and Services.
It is also used for the Enrichment of Gas, and has an illuminating value double that of 90 per cent. Benzol.
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Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
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THE MAXIM PATENT CARBURETTOR.

For Prices, &c., apply to
THE GAS LIGHTING IMPROVEMENT CO., LTD.,
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SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
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GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

FIDDES-ALDRIDGE
SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges at One Stroke.
See Advertisement, June 23, p. IV. of Centre.
ALDRIDGE AND RANKEN,
9, VICTORIA STREET, WESTMINSTER, S.W.
Telegrams: "MOTORPATHY, LONDON." Telephone: 5118 WESTMINSTER.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS,
73, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "DACOLIGHT LONDON." Telephone: 2336 HOLBORN.

AMMONIACAL Liquor wanted.
CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

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JOHN E. WILLIAMS AND CO.,
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For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
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SPECIALLY prepared for the Manu- facture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

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See Advertisement on p. 1.
FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
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BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

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MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DEWSBURY.

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CLASSES in Gas Engineering, Gas Supply, Chemistry, &c.
CORRESPONDENCE COLLEGE COMPANY, 26, Green Street, CAMBRIDGE.

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H. BIRD, late with Messrs. Biggs, Wall, and Co., is open to CONTRACT for all kinds of Gas-Works Extensions and Repairs. Expert advice and Estimates given, and work carried out to Engineer's Drawings and Specifications.
Address H. BIRD, 101, Alexandra Road, HORNSEY, N.

ROBERT DEMPSTER & SONS. Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

TRAVELLER, with several Years' Experience and Connection among Gas Companies, desires to hear from an Established Firm.
Address No. 4958, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DRAUGHTSMAN. Experienced in the Design and Erection of Gas-Works Buildings, Machinery, Manufacturing and Distribution Plant, &c., is OPEN to ENGAGEMENT. Excellent References.
Address A.K., care of STREET'S, 30, CORNHILL, E.C.

WANTED, an Experienced Gasholder ERECTOR.
CLAYTON, SON, AND CO., LTD., LEEDS.

WANTED, a First-Class Agent for a Belgian Manufacturer of Incandescent Mantles. One who is well introduced with Gas-Fitters in the United Kingdom.
Address "B. A. 1780," AGENCE HAVAS, BRUSSELS.

WANTED, a Correspondence Clerk. Must be good Typist and Shorthand Writer. Experienced in the Meter Trade preferred.
Apply, by letter, giving Full Particulars, to No. 4962, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

RETORT Setters wanted. Well up in Generator, Regenerator, and Inclined Settings. First-Class Workmen only.
Apply, by letter only, to No. 4963, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

RETORT Setters—Wanted, Experienced RETORT SETTER for Three Months.
Apply, by letter, enclosing *copies* of Testimonials and Stating Wages required, to ERNEST A. FRANES, Gas-Works, Ferndale, GLAM.

FOREMAN Fitter and Plumber. Wanted, immediately, by a Gas Company in a growing District, a Reliable Experienced Man, with a Thorough Knowledge of all Forms of Incandescent Lighting, Fixing and Adjustment of Gas Fires, Radiators, Cookers, and Water Heaters. Preference will be given to a Man having Experience in Interviewing Consumers, and the Preparation of Estimates.
Wages £2 per Week to suitable Man.
Apply, by letter only, with Testimonials, to No. 4961, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CITY OF LEEDS.

THE Gas Committee invite Applications from Competent Persons for the Vacant Position of SUPERINTENDENT OF METER INSPECTORS.
Salary, £180 per Annum.
Applications, Stating Age and Previous Experience, accompanied by *Copies* of Three Recent Testimonials, and endorsed "Superintendent of Meter Inspectors," to be sent to the undersigned not later than Saturday, the 18th inst.

ROBERT E. FOX,
Town Clerk.

July, 1908.

WANTED, Second-Hand Bridge-Pipes for Retort-Bench, 5-inch Diameter, Flanged, N Pattern.
Particulars to Mr. HENRY TOBEY, Gas-Works, MALTON.

WANTED, 20 Second-Hand Cast-Iron LAMP-COLUMNS.
Send Prices and Particulars and where they can be Seen, to ALEX. SPARK, Crawlees Cottage, Dalkeith, MIDLOTHIAN.

TEN-TON Tank-Waggon for Hire. Good Condition. Latest Build. Immediate Possession.
SHEPHERD, Milkstone, ROCHDALE.

FOR SALE—About 500 old Street LAMPS, which will be Taken Down during the next Three or Four Months. Made principally of Copper, and Glazed at the Top with Opal Glass; Sides and Bottom, Clear Glass.
Further Particulars can be obtained from the MANAGER, Gas-Works, HEREFORD.

WE have the following New and Over- hauled Second-Hand PLANT FOR SALE:—
Gasholder, 8500 cubic feet, New Steel Tank.
Gasholders, 35 ft. by 10 ft., Cast-Iron Tank.
" 45 ft. by 12 ft.
" 50 ft. by 15 ft. 4 in., Telescopic,
Overhauled and re-erected in new Steel Tanks.
8-inch, 9-inch and 10-inch Condensers.
New "Cripps's" Washer, 8-inch Connections, 200,000 cubic feet per day.
Walker's Purifying Machine.
Exhausters and Engines, Single and Combined, 2000 to 60,000 feet per hour.
Scrubber, 7 ft. diameter, 55 ft. high.
Purifiers, sets 6-fts., 10-fts., 12-fts., and 20-fts.
Plans and Quotations of new Sets.
6-inch to 18-inch Station Meters, Governors, &c. New Drums.
Tar and Liquor Pumps.
Producer-Gas Plants for 150 to 300 H.P.
Boilers, Tanks, and all requisites for Gas-Works.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DEWSBURY (Yorks.)

GAS PLANT FOR SALE.

THE Hastings and St. Leonards Gas Company have still some useful SURPLUS PLANT for Disposal, which is well worth the attention of anyone requiring such.
This Plant (including Retort-House Fittings, Purifiers, Exhausters, Washers, Meters, Girders, Connections, &c., Particulars of which will be furnished on Application) is suitable for Works up to 1½ Millions per diem capacity, and is only out of use owing to the new Glyne Gap Works.

CHAS. E. BOTLEY, M.Inst.C.E.,
Engineer and General Manager.

BOROUGH OF LONGTON.

TENDERS FOR GAS COAL.

THE Gas and Electricity Committee invite TENDERS for the Supply of GAS COAL, (Burgy, Nuts, or Washed Beans).
Specification of Quantities, &c., and Form of Tender may be obtained on Application to the undersigned.
The Committee do not bind themselves to accept the lowest or any Tender.
Tenders, endorsed "Tender for Gas Coal," to be sent in, addressed to the Chairman of the Gas and Electricity Committee, not later than July 18, 1908.

W. LANGFORD,
Engineer and General Manager
Gas and Electricity Works, Longton,

RAMSGATE CORPORATION.

(GAS AND WATER DEPARTMENT.)

THE Gas and Water Committee invite TENDERS for the Supply of 10,000 Tons of Best Quality Soft Caking and Gas Producing, Screened or Unscreened, Durham or other COAL, delivered free into Carts on the Quay at Ramsgate Harbour or free into the Stores at the Gas-Works. Delivery as from Feb. 1, 1909.
Tenders to be sent in not later than Noon on Monday, July 20, 1908, addressed to the Chairman of the Gas and Water Committee, Boundary Road, Ramsgate, endorsed "Coal."
The Committee do not bind themselves to accept the lowest or any Tender.
Full Particulars and Form of Tender on Application to the undersigned.

WM. THOMPSON,
Engineer and Manager.

Gas and Water Offices,
Ramsgate, July, 1908.

ROTHWELL URBAN DISTRICT COUNCIL, NORTHAMPTON.

TENDERS FOR GAS COAL.

THE above Council invite Tenders for the Supply of the whole or part of about 1400 to 1600 Tons of Best Screened GAS COAL and NUTS delivered at Desborough Station (Midland Railway) in such Quantities as may be required by the Council's Gas Manager during the Year ending June 30, 1909.
Further Particulars can be obtained from Mr. A. T. Harris, the Council's Gas Manager.
Sealed Tenders, endorsed "Tenders for Coal," must reach the undersigned not later than Wednesday, the 15th inst.
The Council do not bind themselves to accept the lowest or any Tender.

By order,
THOMAS TOZER,
Clerk to the Council.

Market House, Rothwell,
Northants, July 1, 1908.

CORPORATION OF COVENTRY.

(GAS DEPARTMENT.)

COKE-HOPPERS.

THE Gas Committee of the Coventry Corporation invite TENDERS for the Manufacture and Erection of 32 COKE-HOPPERS, including Doors, Levers, &c., at their Foleshill Works.
These Hoppers will comprise about 34 Tons of Cast-Iron in Brackets, Plates, &c., and about 27 Tons of Steel Work in Joists, Plates, Doors, Levers, &c.
Form of Tender, with Specification, Bill of Quantities, General Conditions, and Copy of Drawings, may be obtained on Application to the undersigned, and on Payment of 10s. 6d. which will *not* be returned.
The Committee do not bind themselves to accept the lowest or any Tender.
Sealed Tenders, addressed to the Chairman of the Gas Committee, Gas-Works, Coventry, must be delivered by first post Monday, the 13th day of July next, endorsed "Tender for Coke-Hoppers."

FLETCHER W. STEVENSON,
Engineer and General Manager.

Gas-Works, Coventry,
June 29, 1908.

PONTYPRIDD URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

OIL FOR CARBURETTED WATER-GAS PLANT.

THE above Council invite Tenders for the Supply of 200 to 300 Tons of OIL for the Manufacture of Carburetted Water-Gas, during the Year ending June 30, 1909.
The Oil is to have a flashing point of not less than 73° Abel's Test.
Sealed Samples and Analyses of Oils offered must be sent to Mr. E. H. Swain, Engineer and Manager, Gas-Works, Treforest, Pontypridd, from whom any further Information may be obtained.
The Prices must be quoted per Imperial Gallon, and include Delivery in Sellers' Tanks at the Gas-Works Siding, Glyntaff, on the Alexandra (N. & S. W.) Docks and Railway Company's line.
Tenders, Sealed and Endorsed "Gas Oil," must be received by the undersigned not later than Monday, July 27, 1908.

J. COLENSO JONES,
Clerk to the Council.

Municipal Buildings,
Pontypridd, July 3, 1908.

MALTON GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors invite Tenders for the Supply of about 5000 Tons of GAS COAL, to be delivered at Malton Station in the Twelve Months ending June 30, 1909.
Tender Forms and further Particulars may be obtained on Application.
Tenders to be delivered at the Offices of the Company on or before Monday, the 13th of July inst.

HENRY TOBEY,
Secretary.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for the Supply of 13,000 Tons of COAL.
Specification and Form of Tender may be obtained upon Application to Mr. W. Whatmough, Gas Manager.
Sealed Tenders, endorsed "Coal," to be sent to me not later than Saturday, July 11, 1908.

By order,
GEO. G. BOUCHIER,
Town Clerk.

Municipal Buildings, Heywood,
June 24, 1908.

NORTHWICH GAS COMPANY.

THE Directors of the Northwich Gas Company invite TENDERS for the Supply of about 7000 Tons of GAS COAL during the Year ending June 30, 1909.
Full Particulars, and Printed Forms of Tender, may be had on Application to the undersigned.
Tenders, endorsed "Coal," are to be sent in addressed to the Chairman by Thursday, July 9, 1908.

SAML. S. MELLOR,
Manager and Secretary.

Gas-Works, Northwich,
June 22, 1908.

THE Millom Urban District Council invite TENDERS for the Work and Part Materials connected with the Renewal of RETORTS at the Millom Gas-Works, in accordance with the Specification (prepared by Mr. G. Keyte, Gas Engineer, Workington) copy of which can be obtained upon Application to the undersigned.
Sealed Tenders to be sent in to me by noon on the 14th of July, inst. marked "Retorts."
The Council will not be bound to accept the lowest or any Tender.

W. T. LAWRENCE,
Clerk.

Millom, July 3, 1908.

BOROUGH OF LEIGH.

(GAS AND WATER DEPARTMENTS.)

THE Gas and Water Committee of the above Corporation are prepared to receive TENDERS for the Supply of about 13,000 Tons of Screened and Unscreened GAS COAL, NUTS, and SLACK.
Forms of Tender may be had on Application from the undersigned to whom all Inquiries must be addressed; and all Offers must be made on the Official Forms, or they will not be considered.
Sealed and endorsed Tenders must be delivered to Mr. Stanley Wilson, Town Clerk, Town Hall, Leigh, Lancashire, on or before Twelve o'clock noon, on Friday, the 17th day of July, 1908.
The Corporation do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to divide any Tender.

JAMES GIBSON,
Engineer and Manager.

Gas and Water Offices, Leigh,
Lancashire, June 25, 1908.

LONDON COUNTY ASYLUM, HANWELL, W.

THE Sub-Committee for the Control and Management of the above-named Asylum are prepared to receive OFFERS for the Purchase of TAR and AMMONIACAL LIQUOR for the Twelve Months ending June 30, 1909.
Terms, Cash on Removal.
Forms of Tender, with Estimated Quantities for Sale, may be obtained on Application to the Resident Engineer at the Asylum.
Tenders, in sealed covers, endorsed "Tender for Tar and Liquor, Hanwell Asylum," must be sent to the undersigned by or before Ten o'clock a.m. on Saturday, the 11th of July, 1908.
The Sub-Committee do not bind themselves to accept the highest or any Tender.

H. F. KEENE,
Clerk of the Asylums Committee.

London Asylums Committee Office,
6, Waterloo Place, S.W.,
June 30, 1908.

MANCHESTER CORPORATION GAS-WORKS.

TO OIL IMPORTERS AND OTHERS.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the Supply, by the end of April, 1909, of 9000 Tons of OIL, to be delivered in Three Cargoes in October, 1908, and January and April, 1909, respectively, for the Manufacture of Carburetted Water Gas.
Description of the Oil, Conditions of Contract, and further Particulars may be obtained on Application (in writing only) to Mr. Charles Nickson, Superintendent of the Gas Department.
Sealed Tenders and Samples, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Gas Oil," must be delivered at the Office of the Superintendent of the Gas Department, Town Hall, Manchester, on or before Thursday, the 16th of July, 1908.
The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
July 3, 1908.

COUNTY BOROUGH OF OLDHAM.

THE Oldham Corporation Gas-Works Committee are prepared to receive TENDERS for the Supply of about 90,000 Tons of COAL for the Nine Months commencing the 1st of September, 1908.

Specifications and Forms of Tender can be obtained on Application to Mr. Arthur Andrew, Gas and Water Offices, Oldham, to whom Tenders are to be sent on or before Tuesday, July 14, 1908.

J. H. HALLSWORTH,
Town Clerk.

Oldham, June 18, 1908.

THE Owner of the Patents No. 90 of 1906 (Tubes made of Spirally Wound and subsequently Soldered Metallic Strips and Process of Manufacturing the same), and No. 14,189 of 1906 (Machines for the Manufacture of Tubes from Metal Strips), wishes to Negotiate with Manufacturers with the view of Granting LICENCES under them on reasonable Terms.

For Information, Apply to Messrs. LLOYD WISE AND Co., Chartered Patent Agents, 46, LINCOLN'S INN FIELDS, W.C.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
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Manufacture and keep in Stock at their Works (also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

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for determining the calorific value of gases

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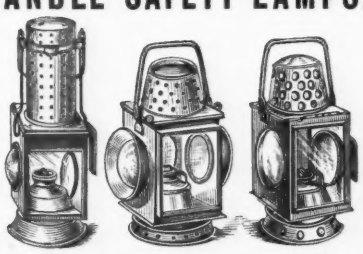

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Gas Apparatus of all Descriptions. Gasholders and Steel Tanks a Speciality.

SPECIALITIES:

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Patent Tar Fog and Naphthalene Extractor.
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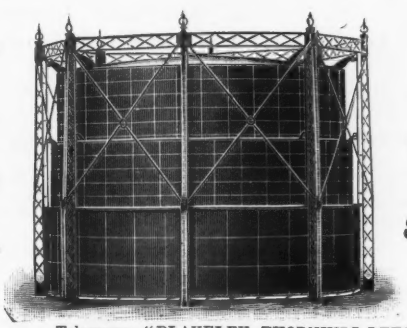

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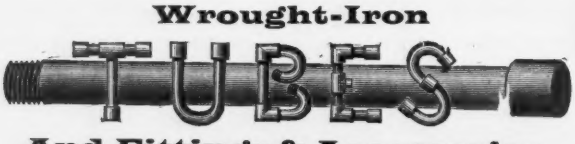

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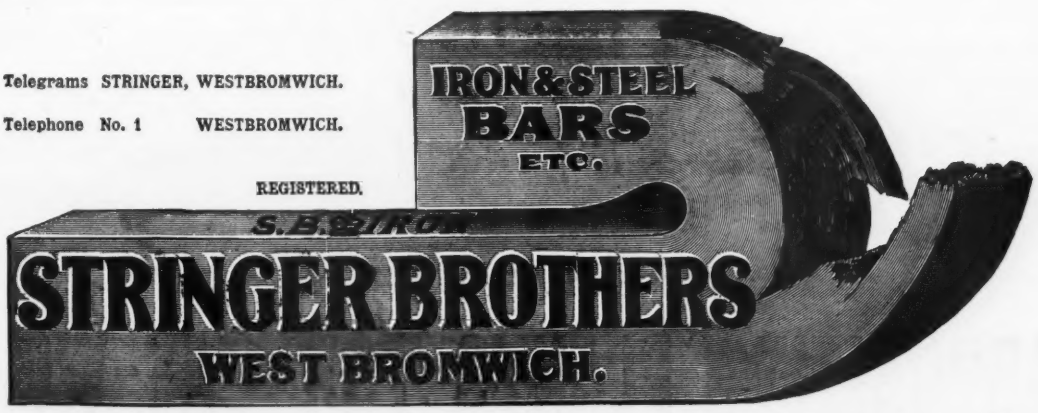

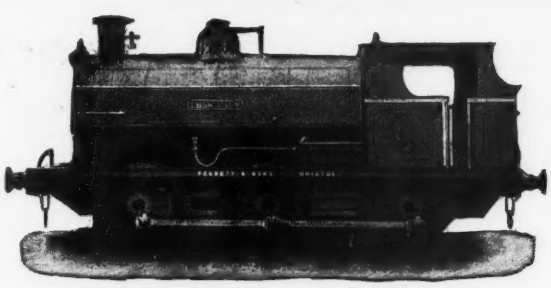

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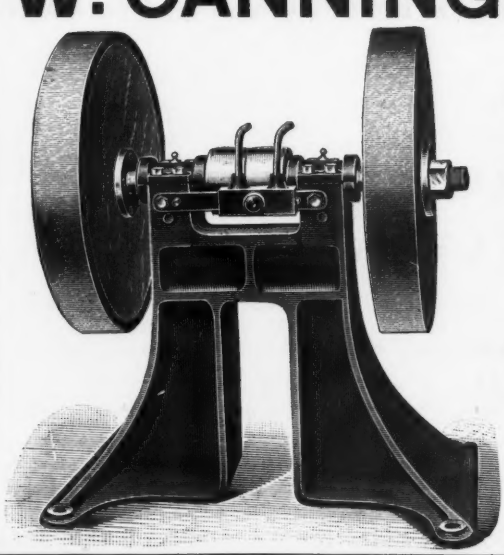

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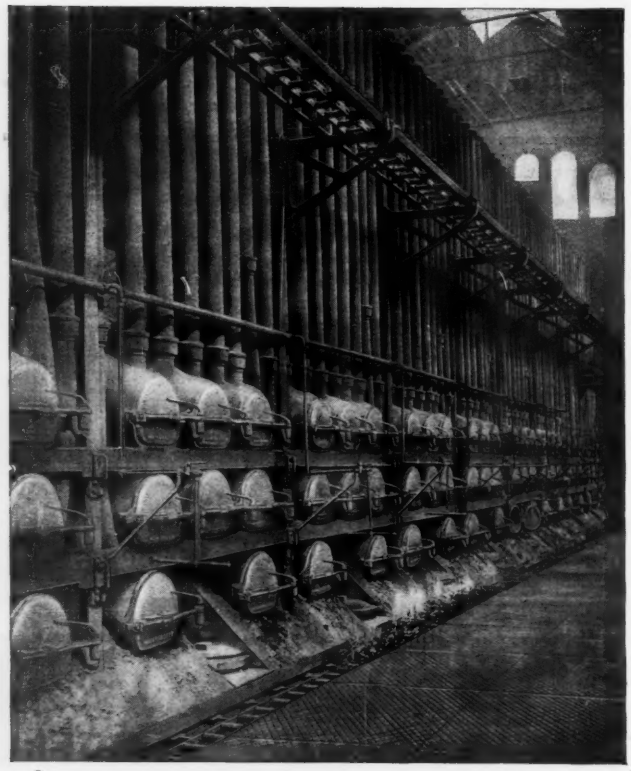

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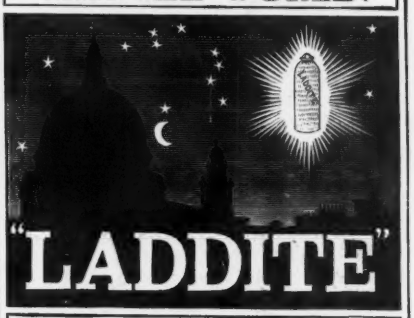

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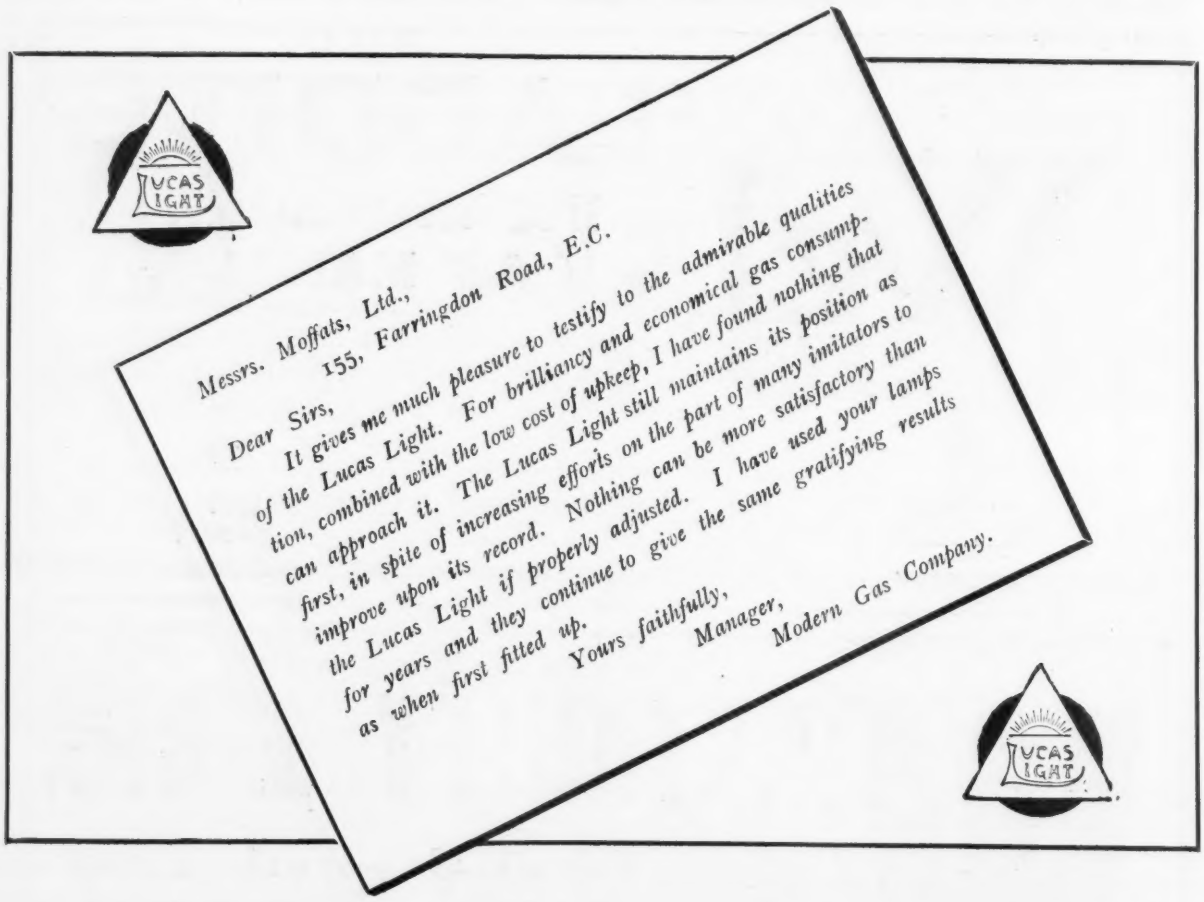
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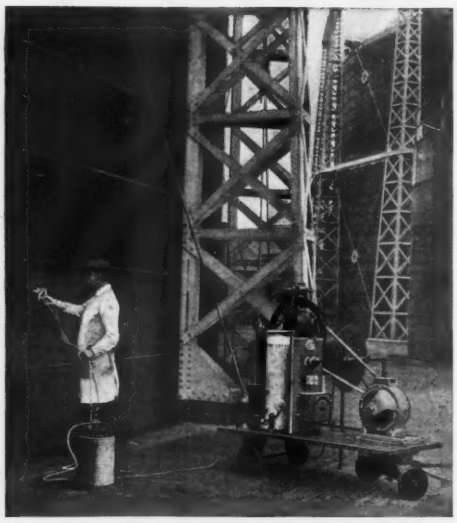

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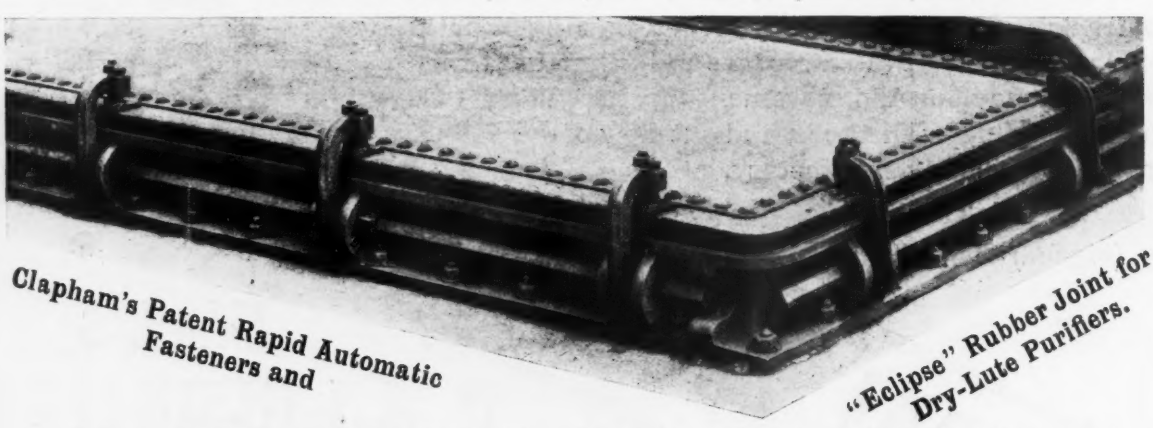

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